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May 20, 2002
Date

David L. Parker

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reexamination of:
Leon, et al., US Patent 5,832,461

Reexam Serial No.: 90/005,841

Filed: October 6, 2000

For: INVESTMENT MANAGEMENT

Group Art Unit: 2122

Examiner: J. Rossi

Atty. Dkt. No.: TTHC:001/DLP

BRIEF ON APPEAL

Commissioner for Patents
Washington, D.C. 20231

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For: INVESTMENT MANAGEMENT	

APPEAL BRIEF

BOX AF
Commissioner of Patents
Washington, D.C. 20231

Sir:

Appellants hereby submit an original and two copies of this Appeal Brief to the Board of Patent Appeals and Interferences in response to the final Office Action dated Februrary 11, 2002 (the "Action"). The Notice of Appeal was filed on March 11, 2002, and received in the PTO on March 19, 2002, making the present appeal brief due on May 19, 2002. In that May 19th was a Sunday, the present brief is due May 20, 2002.

The fee for filing this Appeal Brief is $160.00 and is enclosed herewith. Please date stamp and return the attached postcard as evidence of receipt.

I. REAL PARTY IN INTEREST

The real party in interest is Trans Texas Holdings Corp.

II. RELATED APPEALS AND INTERFERENCES

There is currently pending a related reexamination, Reexam Serial Number 90/005,842, in which an appeal is being pursued concurrently herewith.

III. STATUS OF THE CLAIMS

No claims have been amended during the instant reexamination. A copy of the pending claims is attached as Appendix 1.

IV. STATUS OF AMENDMENTS

No amendments were sought to the pending claims.

V. SUMMARY OF THE INVENTION

The invention defined by the pending claims concern generally an investment system that institutes inflation-adjusted deposit and loan accounts and matches such accounts to provide an improved capital structure for a financial institution. The system projects the impact of inflation-indexed deposit and loan accounts on the institution's capital structure for preselected or anticipated inflationary environments. Based on such projections and other general considerations, one of several forms of deposit accounts is selected according to the requisites of the depositor or borrower and those of the institution. The systems are represented generally by independent claims 1, 24 and 36.

As contemplated under the present invention, the accounts are characterized by a principal component and an accrual component. Principal component is that proportion of the overall account balance attributable to the initial cash investment. The accrual component

indicates that proportion of the overall account balance attributable to inflation and fixed interest. The account components are periodically enhanced or reduced in a manner specified by the characteristics of the particular account selected.

The accrual component will generally include both a fixed interest component and a variable interest component with the variable interest component being responsive to the rate of inflation. Responsive to the rate of inflation is specifically defined at column 3, lines 12-14 to mean "directly responsive to a market indicator of prior actual inflation" and it is not meant to include the market's expectation of future inflation. Under one alternative, the principal component is enhanced by the variable interest component and the account retired by retiring the fixed interest component by one schedule and retiring the principal component by a second schedule. However, the account may be retired by retiring both components over a similar schedule or by amortization. By varying the manner in which each respective component is accrued or retired, the cash flow characteristics of the account can be significantly altered to fit the requisites of the individual or institution. Cash flow is defined as the overall flow of cash units from the account, or a selected account component, to the account holder who will either be the lender or depositor, at a specified time.

Since the accrual component of either loan or deposit accounts may be adjusted in response to inflation, they can potentially exhibit unfavorable cash flows. Therefore, it is generally desirable to match loan accounts with deposit accounts, and further generally desirable to match accounts with similar intrinsic cash flow characteristics as specified by their accrual and retirement features. In this manner, cash flow patterns of the loan account would mirror those of the matched deposit account. Thus, during times of inflation, for example, negative cash flows attributable to outgoing retirement payments on deposit accounts will be compensated for by

incoming payments on loan accounts. This is the so-called "fully hedged" system as set forth in claims 36-44.

Once the appropriate form of deposit and loan accounts are selected, matched and placed with the institution, data processing is utilized to service them during their respective terms. As referred to herein, the account term is the time period over which the account is retired or "paid out" to the account holder. The account term is generally divided into a plurality of adjustment or iteration periods, however, terms may be scheduled to include only a single iteration. Servicing includes the determination of inflation adjustments to the account balance or, alternatively, the inflation premium due the account holder. Servicing also includes features which protect the principal or balance of the accounts from the effects of deflation and reports all bookable income to holder.

Servicing further includes data processing for retiring and enhancing the accounts according to their respective terms and schedules. Retirement is meant to include a reduction in the particular account component and enhancement is meant to include an increase or accrual of the particular account component. For example, accrual components may be retired separately from the principal component by selecting separate schedules for each. Thus, for example, the principal may be retired semi-anually and the accrual retired annually. Schedules may be selected which adjust particular components by a predetermined amount. Alternatively, account components may be retired by amortization.

VI. ISSUES ON APPEAL

1) Whether the subject matter of claims 24-26, 28-32, 34-37 and 38-44 is obvious over the combination of Mukherjee *et al.* ("Mukherjee" – Exhibit A) in view of Musamanno *et al.* ("Musamanno" – Exhibit B)?

2) Whether the subject matter of claims 1-23, 31, 33 and 44 is obvious over the combination of Mukherjee in view of Bodie (Exhibit C) and Musamanno?

3) Whether the subject matter of claims 27 and 38 is obvious over the combination of Mukherjee in view of Musamanno and Williamson *et al.* ("Williamson" – Exhibit D)?

VII. GROUPING OF THE CLAIMS

For purposes of this Appeal, all of the claims shall be considered separately and do not stand or fall together.

VIII. ARGUMENT

A. Objection to Claim 10 as Being a Substantial Duplicate of Claim 9

The Action first objects to claim 10 as being a substantial duplicate of claim 9. The Patent Owner respectfully traverses this objection.

Although Patent Owner recognizes that relief for claim objections must be sought by means of petition to the Commission, 37 C.F. R. §1.81, the Examiner is requested to reconsider and withdraw the objection to avoid the necessity for a separate petition. A plain reading of claims 10 and 9 show, without doubt, that claim 10 can in no way be considered a substantial duplicate of claim 9. Patent Owner reserves its right to file an appropriate petition should it be necessary.

In claim 10, the loan account retiring means includes a means for retiring the fixed interest component by a first schedule over the term, and a means for retiring the loan principal component by ***amortization*** over the term.

In contrast, in claim 9, the loan account retiring means includes a means for retiring the fixed interest component by a first schedule over the term, and a means for retiring the loan

principal component by ***a second schedule*** over the term. Thus, claim 9 is broader than claim 10 in that it does not require that the principal be retired by amortization.

B. The Final Action Misinterprets the Meaning of the Term "Responsive to the Rate of Inflation"

In a matter relevant to all of the pending claims involved in this appeal, the Final Action has taken the position that the claim term "responsive to the rate of inflation" includes functions that are not directly adjusted according to past inflation. In so doing, it states that claims are given their "broadest reasonable interpretation" during examination, citing *In re Zletz*, 13 USPQ2d 1320 (Fed. Cir. 1989). Final Action at pages 32-33. However, what the Examiner failed to consider is that, although claims are construed broadly when before the office, the interpretation must be reasonable and ***consistent with the specification***. See, *e.g.*, *In re Hiniker Co.*, 150 F.3d 1362, 1368, 47 U.S.P.Q. 2d 1523, 1537 (Fed. Cir. 1998) ("..claims in a reexamination proceeding are given their broadest reasonable interpretation consistent with the specification.").

The position taken by the Examiner with respect to the claim element "responsive to the rate of inflation" is neither reasonable nor consistent with the specification, given that Patent Owner expressly defines the term in the specification. The specification states that "[r]esponsive to the rate of inflation, as used herein, means ***directly responsive*** to a market indicator ***of prior actual inflation***..." '461 specification, col. 3, lines 11-12 (emphasis supplied). Thus, responsive does not mean "partially" responsive, or "somewhat" responsive, or "sometimes" responsive, it means "directly" responsive to an indicator of prior "actual" inflation. In each of the examples in the '461 specification, the inflation component is adjusted for any amount of inflation, and adjusted on a one-for-one basis. '461 specification, col. 10 to col. 26. Accordingly, reading the definition and the examples, one of skill would understand that there must be a direct

correspondence between the rate of inflation and the amount by which the variable interest component is adjusted.

The Action relies on the overly generalized proposition that limitations from the specification are not read into the specification. However, the line of cases upon which this reasoning is advanced is not applicable to the current situation in which a claim term is expressly defined in the specification. Where an applicant defines a claim term in the specification, that definition should be referred to in order to interpret the claim language. *In re Zletz*, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989); *In re Morris et al.* 127 F.3d. 1048, 1054, 44 USPQ2d 1023, 1037 (Fed. Cir. 1997) ("Since it would be unreasonable for the PTO to ignore any interpretive guidance afforded by the applicant's written description ...the PTO applies to the verbiage of the proposed claims the broadest reasonable meaning of the words.... taking into account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description contained in the applicant's specification.").

The Patent Owner's proposed construction of the term "directly responsive" as requiring an inflation adjustment component that ***directly*** mirrors an indicator of past inflation is supported by a construction of the relevant claims entered following a *Markman* hearing by the Western District of Texas. *See*, Order 10-12, 15, Exhibit E. For example, the court found that "responsive to the rate of inflation" means "directly responsive to a market indicator of prior actual inflation and is not meant to include the market's expectation of future inflation." Order at p. 15. In making its finding regarding the meaning of "responsive," the court agreed "the ['461] specification only discloses a ***direct*** relationship between the market indicator of inflation and the account balance," and observed:

> The '461 patent uses the phrase "responsive to the rate of inflation" ***which more clearly imparts a one-to-one correlation*** [between the market indicator of inflation and the amount the account must be adjusted].

Id. (emphasis supplied). Thus, an indexed account that is not adjusted at all until comparatively high levels of inflation are reached, and then only adjusted in a step-wise, rounded-off fashion, is not ***directly*** responsive to past inflation and would be outside of the scope of the claim.

C. Rejection of Claims 24-26, 28-32, 34-37 and 38-44 Under 35 U.S.C. §103 (a)

The Final Action rejects claims 24-26, 28-32, 34-37 and 38-44 under 35 U.S.C. §103 (a) over Mukherjee in view of Musmanno. The Action takes the position, generally, that Mukherjee teaches the concept of indexing accounts according to the rate of inflation, and that Musmanno teaches various concepts, including the use of computers to make calculations. The Patent Owner respectfully traverses.

1. Claims 24-26, 28-32 and 34-35

Turning first to independent claim 24, the Action takes the position that each of the elements of the claim, except the use of a data processor, are described in Mukherjee and that Musmanno teaches the use of data processors to calculate amounts in deposit and loan accounts.

a) The Mukherjee Accounts Were Not "Directly" Responsive to the Rate of Inflation

In response, the Patent Owner would first direct the Board's attention to the requirement in claim 24 that the deposit account must have both a principal component and an accrual component, and further wherein the accrual component comprises a variable interest component that is enhanced at an index "responsive to the rate of inflation." As indicated above, this claim term, as properly construed, requires that the variable interest component is enhanced at an index ***directly*** responsive to the rate of inflation. The indexed accounts taught in Mukherjee operate in a very different fashion—one that is not "directly responsive to the rate of inflation"—and thus

inconsistent with and contrary to the language of claim 24. The Final Action itself acknowledges that Mukherjee employs a different function in this respect than the claimed method, but argues that the claims include other than one-to-one adjustments for past inflation if given their "broadest reasonable interpretation." Final Action at pages 32-33. For the reasons set forth above, which are incorporated herein by reference, this interpretation of the claim is incorrect.

The Action relies upon the description in Mukherjee beginning at page 50, column 2 *et seq.*, where reference is made to the statement that "[o]nce the cost-of-living index had risen 2 points ... the capital was increased by as many as full 2 per cents ..." The Action, however, fails to recognize the subsequent statements that make it clear that the Finnish indexed accounts were not, in fact, adjusted as a function of inflation, as that statement must be understood with reference to the above definitions.

First of all, it is clear that with respect to deposit accounts, under the Finnish system there was ***no*** adjustment if inflation was ***less*** than 2% ("[o]nce the cost of living index had risen 2 points ..."). This feature is clearly contrary to the express language of the claims and, indeed, thwarts the overall purpose of the presently claimed invention: to provide indexed adjustments during times of ***any*** inflation.

Moreover, under the Finnish system, even in those years where inflation had reached the initial 2% threshold requirement, there was no delineable function that correlated the amount of the adjustment with the degree of inflation. From a careful reading of Mukherjee, it becomes evident that only whole-number percentage index-based adjustments were made to the accounts, based upon whole number rounding off of the rate of inflation ("... the figures used were the [average] (to the nearest whole number) of the index values ...", page 51, para. 3). Thus, if inflation was 2.1 % or 2.3% or 2.49%, the adjustment would be only 2%. But if inflation was

2.55% or 2.99%, then, presumably, the adjustment would be 3%. Clearly, the adjustment was not being made as a ***direct*** function of inflation—there is no "one-to-one" correlation as required by the claim.

The Examiner concludes by suggesting that the Applicant should amend the claims to "more narrowly" recite the directly responsive function "in order to make this argument have merit." Final Action at 34. The Patent Owner submits, however, that the properly construed claims must be accepted as having the suggested "merit" under the applicable legal precedent as set forth herein above.

b) The Mukherjee Accounts Do Not Have a Term As Required by Claim 24

It is further again noted that claim 24 requires paying the deposit account for a specified term, whereas the accounts discussed in Mukherjee do not have "term" *per se*. The Action contests this position, yet fails to identify or describe what it considers the "term" to be in Mukherjee. Instead, the Action concedes this for the sake of argument, and falls back on the position, without explanation, that somehow the prior art "as a whole" obviates this claim requirement. Final Action at ¶ 57, pages 34-35. On the contrary, the requirement in claim 24 that the accounts have a specified term for paying out the account is inconsistent with the teachings of Mukherjee. Unlike bonds, the Mukherjee accounts, as best as can be determined, did not have a particular pre-set term for payout and the Action has provided no reasonable explanation how the prior art teaches modification of the indexed accounts of Mukherjee to provide for a set term.

c) There Is No Suggestion to Modify Mukherjee to Incorporate a Data Processor

With respect to Musmanno, it is respectfully submitted that this reference is in no way combinable with the teachings of Mukherjee and, in any event, nevertheless fails to teach or

in that Musmanno talks of computational iterations, which are clearly not a division of a time period ("term") into sub-periods of time.

The Final Action has no response to this position other than to state that that rejection is based on a combination of references and there are "well known statements." One is only left to wonder what "well known statements" the Examiner is referring to. Furthermore, this is totally inadequate basis – the claim language must be taken into account, and it is wholly inappropriate to reject these claims on the basis of what the examiner alleges, without any support in the prior art whatsoever.

The Federal Circuit has very recently held it entirely inappropriate to base a rejection on "common knowledge" where such is contested, and found that the reliance of an Examiner and the Board on common knowledge constituted an arbitrary under the Administrative Procedures Act. *In re Lee*, 61 USPQ2d 1430, 1434 (Fed. Cir. 2002). Indeed, similar to our situation here, the Court chastised the Board and the Examiner for failing to require that the prior art contain a "specific hint or suggestion in a particular reference, stating that

> Omission of a relevant factor required by precedent is both legal error and arbitrary agency action. [citations omitted]

Id. The Court continued by noting that merely relying on conclusory statements and so-called common or general knowledge, such as the Examiner has done in the present reexamination, does not fulfill the PTO's obligation. *Id.* at 1434-35.

Claims 26-28 all depend from claim 25, and are thus additionally patentable for the immediately foregoing reason as well.

f) None of the Art Teaches Continuous Compounding

Moreover, with respect to claim 28, which is directed to continuous compounding of the "fixed interest component," the Action concedes that neither reference teaches or suggests

h) The Prior Art Does Not Teach or Suggest an Indexed Account Secured by Property of the Institution

Lastly, with respect to claim 35, which refers to the "deposit account being secured by property of the institution," the Action posits that "this is a well known method of running a bank." The Patent Owner disagrees that it was a "well known" for a bank to secure a deposit account with funds on deposit with that institution. Once again, the Examiner refuses to provide the necessary evidence that such teaching is "well-known" and has instead chosen the simplistic path of simply stating it to be so, without proof. The recent *Lee* case, discussed above, demands otherwise. The Patent Owner specifically requested that the Office make of record whatever evidence it might have in this regard, *see* 37 C.F.R. §1.104(d)(2), and this was not done.

2. Claims 36-44

a) The Fully-Hedged Program

Turning next to a consideration of claims 36-44, it is first noted that independent claim 36 is directed to a particular type of what the patentee refers to as a "fully hedged" program. That is, a program that combines a particular type of inflation-indexed deposit account with an inflation-indexed loan account. It is further noted that both the deposit side and the loan side have both an accrual component and a principal component, and the accrual component is subdivided into a fixed and an indexed component. It should be noted that the indexed component of both the loan side and the deposit side are "responsive" (*i.e.*, ***directly*** responsive, as described herein above) to the rate of inflation. Moreover, the claim refers to retiring the fixed interest component according to one schedule, and retiring the principal by a second schedule.

The Patent Owner would first incorporate by reference the arguments made above with respect to the deposit accounts of claims 24-26, 28-32 and 34-36, which are equally applicable to claims 36-44.

Furthermore, it is noted that the present claim requires a full hedge of a "directly responsive" indexed deposit account, and a "directly responsive" indexed loan account. However, Mukherjee clearly teaches an entirely different system for the loan accounts. The Action makes reference to an excerpt on page 50, para. 3, which states "[t]he initial idea had been to apply an extra charge to all loans equal to half the rise in the index." However, reading on in that same paragraph, one discovers that this was not, in fact, what took place: "[w]hat was eventually decided was different and more complex":

> The money needed to make them keep pace with the cost of living was found by imposing an 'index surcharge' on *all* loans. The amount of the surcharge was usually fixed according to the proportion of the bank's deposits benefiting by index adjustments, so that the bank could just balance its commitments. (emphasis in original)

Mukherjee, paragraph bridging pages 50-51. This concept is explained in more detail at the top of page 68:

> This meant, for example, that in a year when the index rose by 10 per cent, a bank with one fifth of its deposits in fully index-linked accounts would place an index surcharge of 2 per cent on all its outstanding loans.

Thus, there were no loan accounts that obtained "a rate of return 'directly' responsive to the rate of inflation" as required by the claim, only loan accounts that adjusted in a manner that was a combined function of the number of indexed deposit accounts as a percentage of the total deposit accounts. In the example given by Mukherjee and quoted above, any individual loan account was adjusted only 2% when inflation was 10%, and even this number varied depending on the number of indexed accounts -- clearly they were not "directly" responsive.

b) Claims 36-44 Are Directed Specifically to a Fully-Hedged Program

The Final Action's only response is that the claims do not specifically claim a "fully hedged" or a "directly responsive" program. This is simply not true, and it shows that somewhat surprising lengths to which the Examiner appears to be willing to go to defeat the patent under reexamination – to the extent of saying something is not so when it clearly is. The claims at issue (see claim 36) require both a deposit account and a loan account, and require that both be adjusted in a manner responsive to the rate of inflation—this is the fully-hedged program—where possible losses on the deposit side are "fully hedged" by similar gains on the loan side. The system disclosed by Mukherjee can in no way anticipate or obviate claim 36, and dependents therefrom, in that nowhere does Mukherjee teach of suggest the combination of an inflation-adjusted deposit account with an inflation-adjusted loan account. The Examiner has inexplicably chosen to ignore our arguments in this regard.

With respect to dependent claims 37-44, the Patent Owner notes that since these claims depend from claim 36, they are patentable for the reasons discussed above with respect to claim 36. Moreover, all additional arguments discussed above with respect to dependent claims 25-26, 28-32 and 34-35 are incorporated by reference.

D. Rejection of Claims 1-23, 31, 33 and 44 Under 35 U.S.C. §103 (a)

The Action next rejects claims 1-22, 31, 33 and 44 under 35 U.S.C. §103 (a), over Mukherjee *et al.* in view of Bodie and further in view of Musmanno *et al.* The basis of the rejection is similar to that of the claims discussed above. However, with respect to independent claim 1, Bodie is additionally cited for the proposition that it "explicitly suggests an annuity defined in purchasing power terms."

a) Bodie Clearly Teaches Away

In response, the Patent Owner specifically incorporates by reference the relevant arguments set forth under Section I of this response, above, which are generally applicable to a consideration of the invention of claims 1-22, 31, 33 and 44. The only added consideration by the Action is that presented by Bodie. However, Bodie, in fact, argues strongly in favor of patentability of the invention of these claims. Bodie reviews various hypothetical proposals for hedging indexed accounts and, in effect, dismisses them as unworkable ("The experience with VA's has been disappointing but not really that surprising", p. 5). Instead, Bodie concludes that "[g]iven the apparent reluctance, if not outright opposition ... the relevant question is whether we can find any other asset, or combination of assets, currently existing in the U.S. financial system that could fulfill the same function." The conclusion that Bodie reaches is that the solution is, contrary to the claimed invention, to link indexed accounts with "commodity futures contracts." Indeed, one need only consider Bodie's subtitle: "The most promising asset base is T-bills hedged against unanticipated inflation with commodity futures contracts."

This conclusion by Bodie argues in favor of patentability of the present invention for the very reason that "commodity futures contracts" are contrary to the explicit requirements of the claims. A "commodity futures contract" is NOT based on past inflation – it is, by its very nature, based on an expectation of future events. The Examiner's attention is directed, for example, to the '461 specification's specific requirement that "responsive ... is ***not*** meant to include the market's expectation of ***future*** inflation." (emphasis supplied). '461 Specification, Column 3, lines 13-14. As indicated herein above, even though claims may be construed broadly during examination or reexamination, it is improper to construe the claims in a manner inconsistent with the specification. Accordingly, the Examiner is specifically requested to recognize that Bodie

teaches away from the present invention and, as such, must be considered evidence of non-obviousness.

Moreover, commodities futures are known to have little correlation with inflation. Most energy, metals and agriculture futures are trading at the same price ranges for yearly delivery dates that they traded at 20 years ago. For example, natural gas has been brought back to $2.00. So a basket of futures contracts would not be "directly responsive"—or even "responsive"—to inflation. This is shown with particularity in the 1972-1974 Column 5 on Bodie's Table 3. There, the Bodie Real Rate of Return on Commodities Futures was 117% while inflation over the same period was only 25%.

b) The Examiner's Response is Incorrect and Fails to Consider the Bodie Reference as a Whole

The Examiner's only response to the foregoing argument is that "the part of Bodie relied upon is not the part that Applicant has referenced." Final Action at ¶ 68, page 39. However, then, it's not clear at all just what part of Bodie the PTO is relying on. In the first Action, and in the Final Action, the Examiner stated that Bodie was relevant because it "suggested a 'purchasing power annuity' which is linked to the cost of living index (page 5, col. 2)." This is precisely the same language that the Patent Owner is relying on to show that Bodie is evidence of non-obviousness. At page 5, col. 2, second full paragraph, Bodie states that the purpose of the paper is to present a proposal for a different kind of annuity called a "purchasing power annuity, or "PPA." Bodie continues, in the next paragraph, to explain that "at first glance" the only asset that appears capable of providing a base for such an annuity would be "default-free bonds linked to some index of the cost of living," but then Bodie goes on to state that such things don't exist! So Bodie has no explanation or description whatsoever of the nature of this hypothetical index-linked bond, but he concedes that in any event no such instrument exists. The author then states

that the only solution to his desire to provide a PPA would be to base in on commodity futures contracts—an indicator or future expected inflation, not past inflation. *Id.* at page 6, col. 1.

The Examiner has not, but must, consider this evidence of teaching away.

With respect to claims 2-22, 31, 33 and 44, the Patent Owner specifically notes that these claims are dependent from claims shown to be patentable above and are, for this reason, patentable in and of themselves. Moreover, the Patent Owner incorporates by reference the arguments made above with respect to other claims of the '461 patent.

E. Rejection of Claims 27 and 38 Under 35 U.S.C. § 103 (a)

Lastly, the Action rejects dependant claims 27 and 38 under 35 U.S.C. § 103 (a) over Mukherjee and Musmanno, as set forth above, further in view of Williamson.

In response, the arguments set forth above regarding the respective independent claims are specifically incorporated by reference herein. Moreover, it is noted that claim 27 ultimately depends from independent claim 24 and that claim 38 ultimately depends form independent claim 36 and, as such, are patentable on this basis as well.

IX. CONCLUSION

Appellants have provided arguments that overcome the pending rejections. Appellants respectfully submit that the Office Action's conclusions that the claims should be rejected are unwarranted. It is therefore requested that the Board overturn the Action's rejections.

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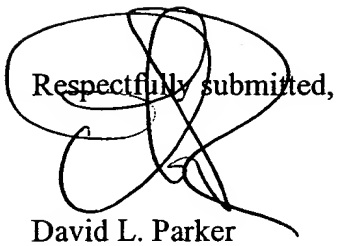

Respectfully submitted,

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Date: May 20, 2002

United States Patent [19]

Musmanno et al.

[11] Patent Number: 4,774,663

[45] Date of Patent: Sep. 27, 1988

[54] **SECURITIES BROKERAGE-CASH MANAGEMENT SYSTEM WITH SHORT TERM INVESTMENT PROCEEDS ALLOTTED AMONG MULTIPLE ACCOUNTS**

[75] Inventors: Thomas E. Musmanno, Brooklyn; Joseph A. Marrone, Copiague; Laura Carey, New York, all of N.Y.

[73] Assignee: Merrill Lynch, Pierce, Fenner & Smith Incorporated, New York, N.Y.

[21] Appl. No.: 553,688

[22] Filed: Nov. 21, 1983

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 430,670, Sep. 30, 1982, Pat. No. 4,597,046, which is a continuation-in-part of Ser. No. 173,331, Jul. 29, 1980, Pat. No. 4,346,442, and Ser. No. 199,408, Oct. 22, 1980, Pat. No. 4,376,978.

[51] Int. Cl.[4] G06F 15/21

[52] U.S. Cl. 364/408

[58] Field of Search ..... 364/408; 364/200 MS File, 900 MS File

[56] **References Cited**

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Primary Examiner—Jerry Smith

Assistant Examiner—Clark A. Jablon

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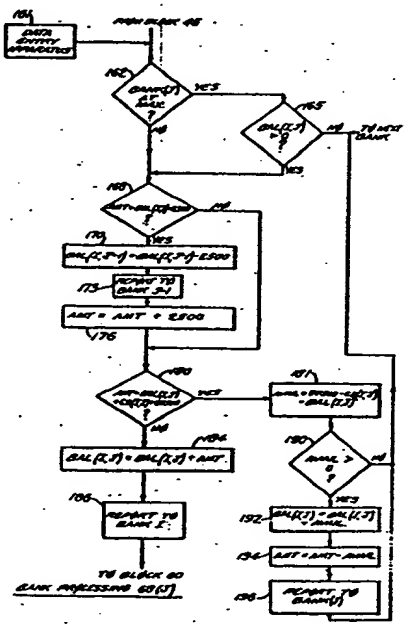
[57] **ABSTRACT**

Data processing for an improved securities brokerage-cash management system supervises, implements and coordinates a margin securities brokerage account; participation in one or more short term investments; and subscriber unilaterally initiated use of charge, debit or checking instruments. Subscriber expenditures, effected as by charge card use, check and/or cash advance are applied on a hierarchal basis, seriatim, against the subscriber's free credit balance, short term investment and the lendable equity in his securities account. On a periodic basis, e.g., daily, received card charges, check, securities and deposit transactions for the ensemble of account participants are verified and employed to compute an updated credit limit for each subscriber.

In accordance with one aspect of the present invention, the short term investments available to subscribers include an ordered ensemble of insured savings accounts.

11 Claims, 5 Drawing Sheets



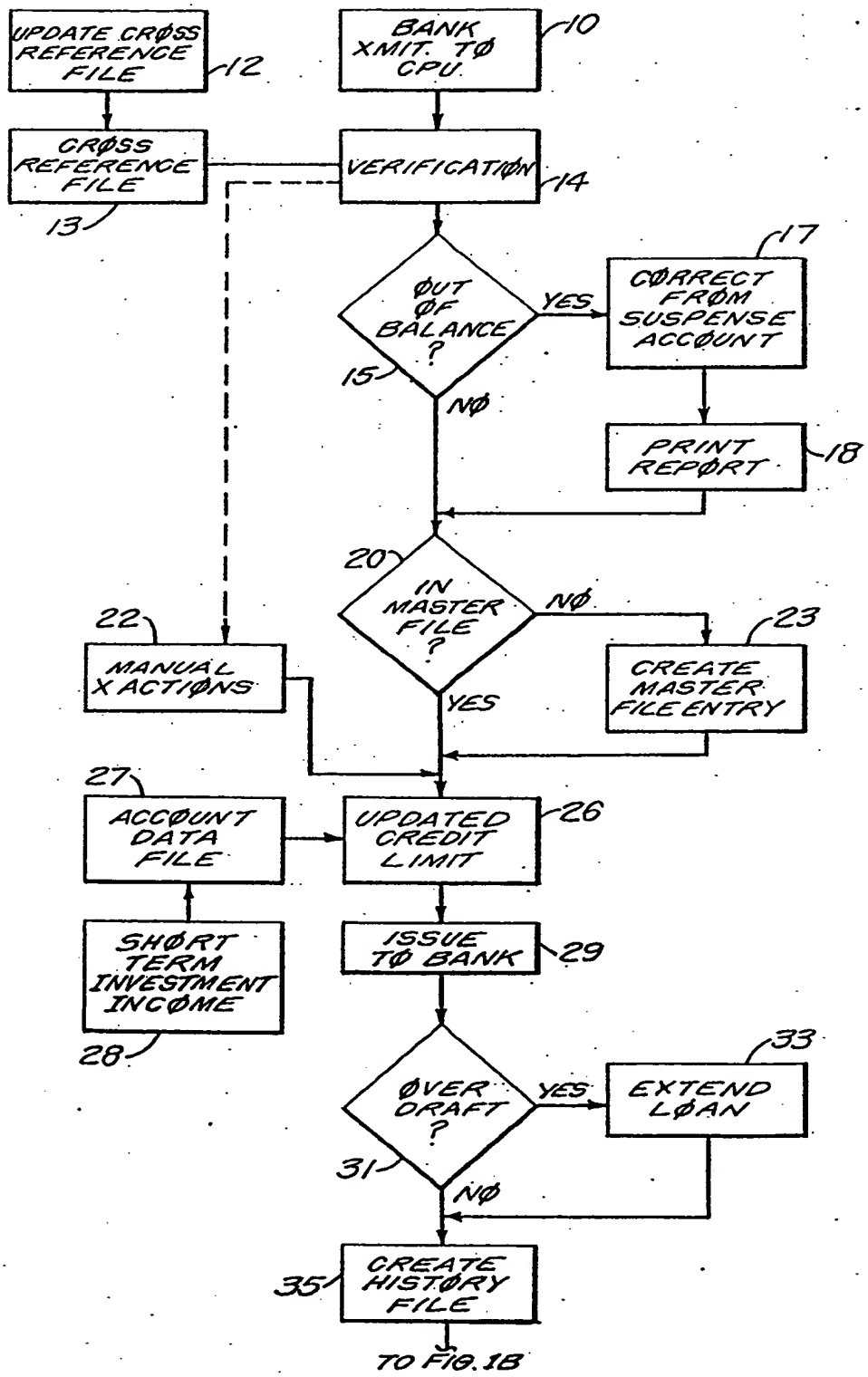

UPDATE CRØSS REFERENCE FILE
12
BANK XMIT. TØ CPU.
10
CRØSS REFERENCE FILE
13
VERIFICATIØN
14
ØUT ØF BALANCE ?
15
YES
17
CØRRECT FRØM SUSPENSE ACCØUNT
NØ
PRINT REPØRT
18
20
IN MASTER FILE ?
NØ
22
MANUAL X ACTIØNS
23
CREATE MASTER FILE ENTRY
YES
27
ACCØUNT DATA FILE
UPDATED CREDIT LIMIT
26
SHØRT TERM INVESTMENT INCØME
28
ISSUE TØ BANK
29
ØVER DRAFT ?
31
YES
33
EXTEND LØAN
NØ
35
CREATE HISTØRY FILE
TO FIG. 1B

FIG. 1A

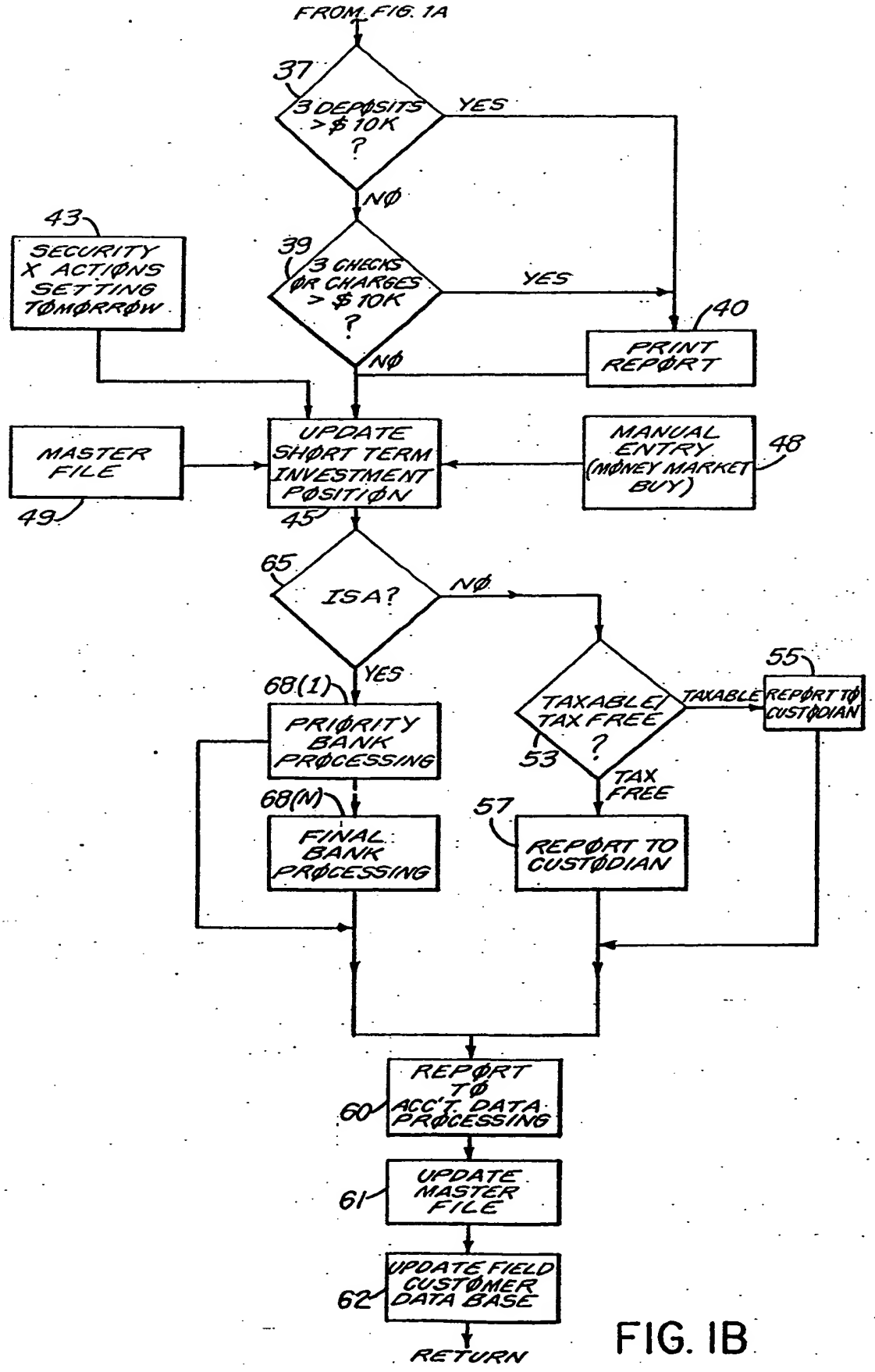

FROM FIG. 1A
37
3 DEPØSITS > $ 10K ?
YES
NØ
43
SECURITY X ACTIØNS SETTING TØMØRRØW
39
3 CHECKS ØR CHARGES > $ 10K ?
YES
NØ
40
PRINT REPØRT
MASTER FILE
49
UPDATE SHØRT TERM INVESTMENT PØSITIØN
45
MANUAL ENTRY (MØNEY MARKET BUY)
48
65
ISA?
NØ
YES
68(1)
PRIØRITY BANK PRØCESSING
68(N)
FINAL BANK PRØCESSING
TAXABLE/ TAX FREE ?
53
TAXABLE
55
REPØRT TØ CUSTØDIAN
TAX FREE
57
REPØRT TO CUSTØDIAN
REPØRT TØ ACC'T. DATA PRØCESSING
60
UPDATE MASTER FILE
61
UPDATE FIELD CUSTØMER DATA BASE
62
RETURN

FIG. 1B

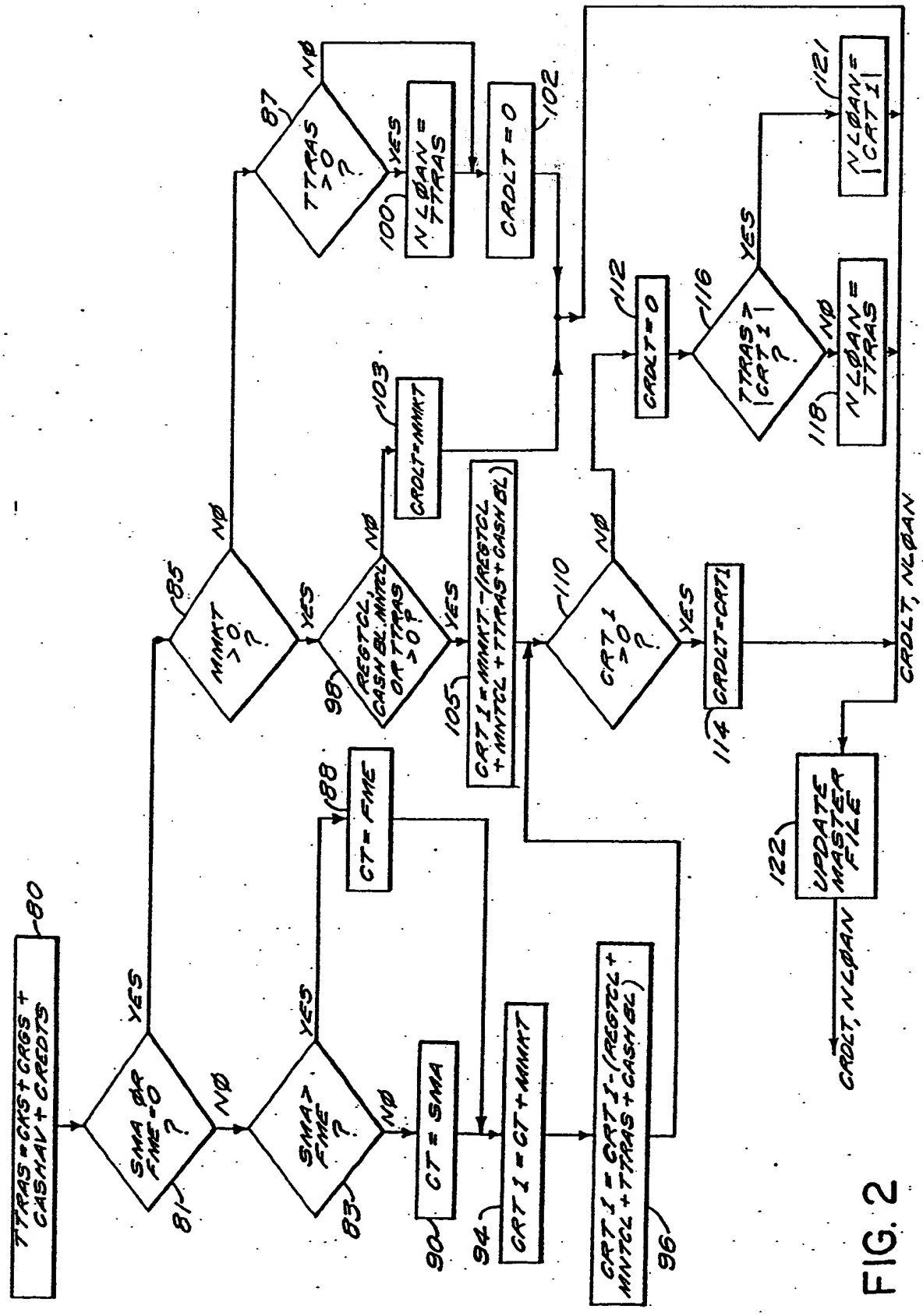

TTRAS = CKS + CRGS + CASHAV + CREDTS
80
SMA & FME = 0 ?
81
YES
NO
SMA > FME ?
83
YES
NO
CT = FME
88
CT = SMA
90
GRT I = CT + MMKT
94
GRT I = GRT I - (REGTCL + MNTCL + TTRAS + CASH BL)
96
MMKT > 0 ?
85
YES
NO
REGTCL, CASH BL, MNTCL OR TTRAS > 0 ?
98
YES
NO
GRT I = MMKT - (REGTCL + MNTCL + TTRAS + CASH BL)
105
CRDLT = MMKT
103
TTRAS > 0 ?
87
YES
NO
N LOAN = TTRAS
100
CRDLT = 0
102
GRT I > 0 ?
110
YES
NO
CRDLT = 0
112
CRDLT = CRTI
114
TTRAS > | GRT I | ?
116
YES
NO
N LOAN = TTRAS
118
N LOAN = | GRT I |
121
CRDLT, NLOAN
UPDATE MASTER FILE
122
CRDLT, NLOAN

FIG. 2

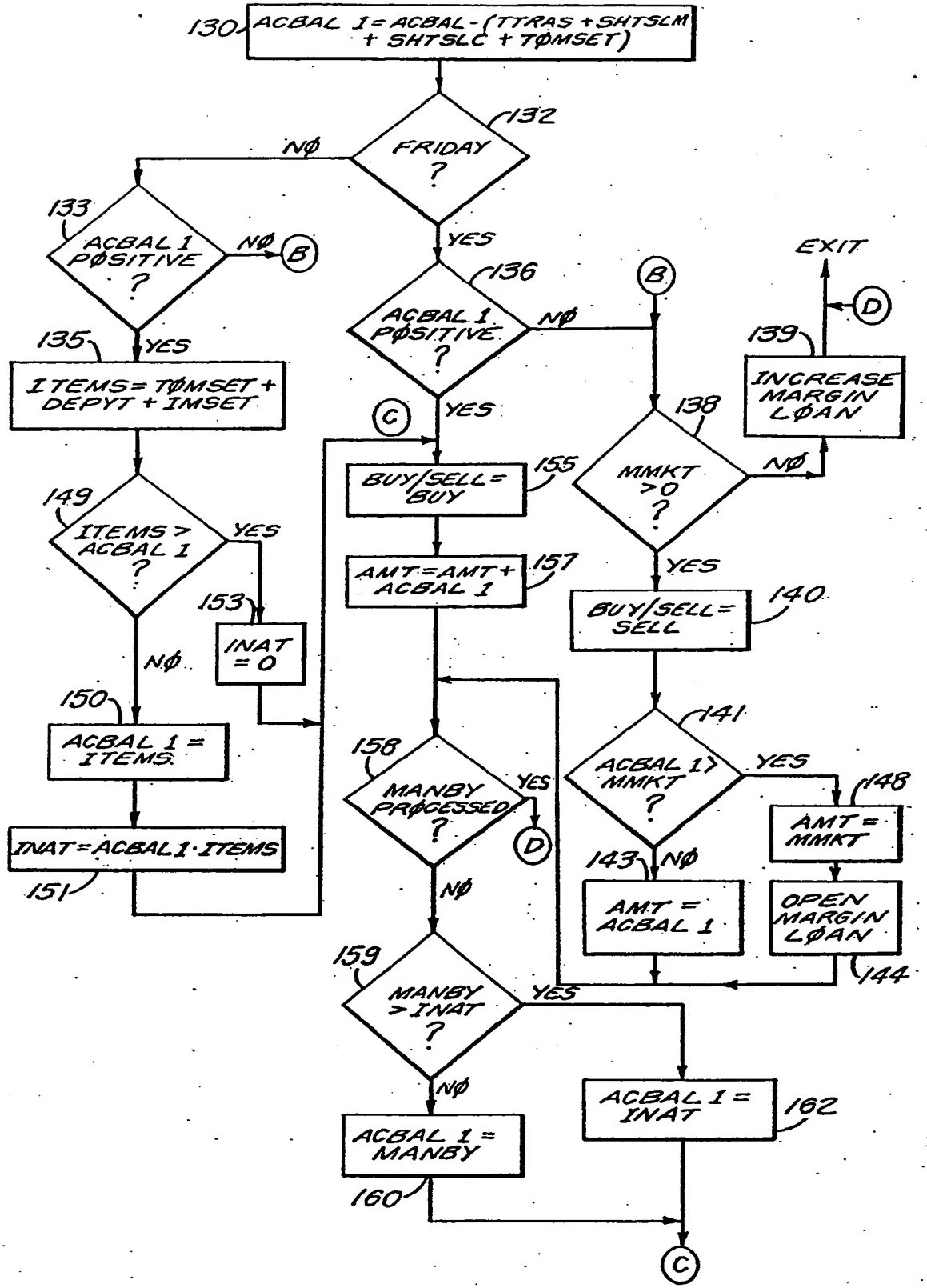

130
ACBAL 1 = ACBAL - (TTRAS + SHTSLM + SHTSLC + TØMSET)
132
FRIDAY ?
NØ
YES
133
ACBAL 1 PØSITIVE ?
NØ
B
YES
135
ITEMS = TØMSET + DEPYT + IMSET
149
ITEMS > ACBAL 1 ?
YES
153
INAT = 0
NØ
150
ACBAL 1 = ITEMS
INAT = ACBAL 1 · ITEMS
151
136
ACBAL 1 PØSITIVE ?
NØ
B
YES
C
155
BUY/SELL = BUY
157
AMT = AMT + ACBAL 1
158
MANBY PRØCESSED ?
YES
D
NØ
159
MANBY > INAT ?
YES
NØ
ACBAL 1 = MANBY
160
C
EXIT
D
139
INCREASE MARGIN LØAN
138
MMKT > 0 ?
NØ
YES
140
BUY/SELL = SELL
141
ACBAL 1 > MMKT ?
YES
148
AMT = MMKT
143
NØ
AMT = ACBAL 1
OPEN MARGIN LØAN
144
ACBAL 1 = INAT
162

FIG. 3

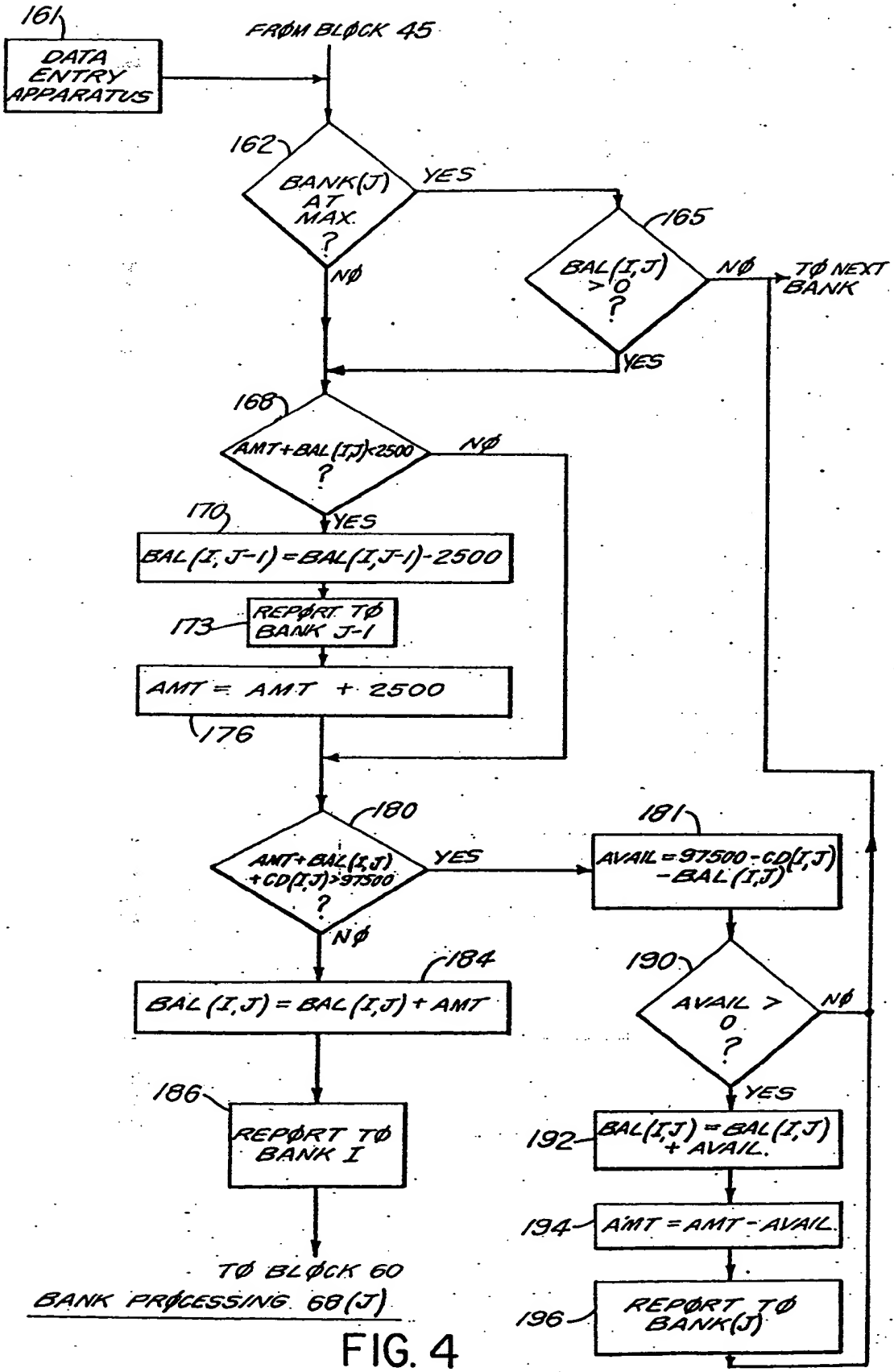

161
DATA ENTRY APPARATUS
FROM BLOCK 45
162
BANK(J) AT MAX. ?
YES
NO
165
BAL(I,J) > 0 ?
NO
TO NEXT BANK
YES
168
AMT+BAL(I,J)<2500 ?
NO
YES
170
BAL(I,J-1) = BAL(I,J-1)-2500
173
REPORT TO BANK J-1
AMT = AMT + 2500
176
180
AMT+BAL(I,J) +CD(I,J)>97500 ?
YES
NO
181
AVAIL = 97500 - CD(I,J) - BAL(I,J)
184
BAL(I,J) = BAL(I,J) + AMT
190
AVAIL > 0 ?
NO
YES
186
REPORT TO BANK I
192
BAL(I,J) = BAL(I,J) + AVAIL.
194
AMT = AMT - AVAIL.
196
REPORT TO BANK(J)
TO BLOCK 60
BANK PROCESSING 68(J)

FIG. 4

SECURITIES BROKERAGE-CASH MANAGEMENT SYSTEM WITH SHORT TERM INVESTMENT PROCEEDS ALLOTTED AMONG MULTIPLE ACCOUNTS

This application is a continuation-in-part of co-pending application Ser. No. 430,670 for "SECURITIES BROKERAGE-CASH MANAGEMENT SYSTEM" filed 9-30-82, now U.S. Pat. No. 4,597,046, which, in turn, is a continuation-in-part of application Ser. Nos. 173,331, filed 7-29-80, and 199,408, filed 10-22-80, now U.S. Pat. Nos. 4,346,442 and 4,376,978, respectively. The disclosure of such applications and patents is hereby incorporated herein by reference.

DISCLOSURE OF THE INVENTION

This invention relates to financial business systems and, more specifically, to data processing methodology and apparatus for effecting an improved securities brokerage and cash management system.

It is an object of the present invention to provide an improved brokerage/cash management system.

More specifically, it is an object of the present invention to provide a data processing implementation for a brokerage-cash management financial system which provides for automatic investment of free credit cash balances in short term investments which include an insured savings account option; a full range of security brokerage transaction functions; which permits consumer transaction ("charge") card and check charges; and which includes safeguards against abuses, e.g., check kiting.

The above and other objects of the present invention are realized in specific illustrative improved securities brokerage-cash management system for supervising, integrating and coordinating a margin securities brokerage account; participation in one or more short term investments; and subscriber-initiated use of a transaction charge card and/or checks. Subscriber expenditures as by charge card use, check, and/or cash advance are applied on a hierarchal basis against the subscriber's free credit cash balance, short term investment and, finally, his securities equity. On a periodic basis, e.g., daily, received card, check, securities and deposit transactions for the ensemble of account participants are verified and employed to compute an updated credit limit for each subscriber.

In accordance with one aspect of the present invention, the short term investments available to subscribers include an ordered ensemble of insured savings accounts.

The foregoing and additional features and advantages of the instant invention will become more readily apparent from the following detailed description of a specific illustrative embodiment thereof, presented hereinbelow in conjunction with the accompanying drawing, in which:

FIGS. 1A and 1B are respectively the upper and lower portions of a schematic flow chart depicting the data processing methodology and structure in accordance with the principles of the present invention for an improved brokerage/cash management system of accounts;

FIG. 2 is a flow chart depicting data processing for the credit limit updating and overdraft functional blocks 26, 31 and 33 of the FIG. 1 overall data processing disclosure;

FIG. 3 is a flow chart illustrating updating a short term investment position functional block 45 of FIG. 1; and

FIG. 4 is a flow chart depicting representative insured savings account processing 68 of FIG. 1.

Referring now to FIG. 1, there is shown in overall scope a data processing and system operational flow chart for implementing an improved securities brokerage/cash management system incorporating the principles of the present invention. As contemplated by the present invention, there are three fundamental aspects of service offered to each of plural system subscriber. At the kernel of the overall system is a margin brokerage account in which each customer may effect the usual diverse array of securities and related transactions—e.g., those offered by a full service brokerage house. As a second facet, there is at least one and in general a plurality of vehicles for short term investment of funds, e.g., pooled trusts and, importantly for present purposes, insured savings accounts ("ISA"). These investment accounts and/or trusts, managed by a bank, fiduciary or custodian with ancillary services possibly furnished by an investment advisor or the like, provide each system subscriber with one or more ways of earning yield on funds not then required for other purposes herein discussed. Such excess funds may be generated by subscriber deposits; by dividends or interest paid on securities in the subscriber's brokerage account; may represent proceeds of sale, securities redemption or like transactions in the brokerage account; or the like. The third and final aspect of the instant system arrangement comprises a transaction ("charge") card and a checking account. The transaction card is usable at the subscriber's sole discretion, under his control, to charge goods and services offered by those accepting the charge card. The charge card may be independent or may be affiliated with some charging system, e.g., the well known "VISA" charge system. The bank checks require no explanation and are simply payment orders drawn against the bank. The check amounts are satisfied from the subscriber's free credit balance, short term investment position or his securities margin account in that order.

By way of brief overall philosophy, charges created by the transaction card and checks drawn against the bank are accumulated by the bank and transmitted to the brokerage house. The brokerage house establishes a credit limit against which each subscriber may use his transaction card and bank checks. The credit limit applicable to each subscriber is in the most fundamental of terms the value of the subscriber's free credit cash as represented by free cash in the brokerage account and by the subscriber's short term investment(s), plus the remaining loanable value of the subscriber's securities. A more precise statement of credit limit and the data processing methodology to determine same is set forth below. Any income or receipts for the subscriber's account, e.g., dividends, interest, sale or redemption proceeds from a securities account or the like, are applied to the overall subscriber's account in a predetermined, hierarchal manner to offer the subscriber either a maximized return or a minimum interest charge. In particular, any received or generated funds are first applied to reduce or eliminate any subscriber overdrafts. Following this, the funds or any remaining portion thereof reduce the subscriber's margin balance. Any excess as a general matter is then automatically invested for the subscriber in the one or more short term investment

vehicles which the subscriber has selected or is entitled to pursue.

Correspondingly, when funds are required of the subscriber to satisfy any transaction or check charges or the like, they are obtained from the composite subscriber account in a hierarchal, priority sequence least negatively impacting the customer. Such funds exceeding yet uncommitted brokerage account cash are first obtained by liquidation of the appropriate short term investments. Any excess requirement is then generated in the form of a margin loan against the subscriber's securities. Should this be insufficient, the overage takes the form of an overdraft loan by the bank to the subscriber subject to the bank's discretion and willingness to provide such an overdraft loan.

With the above overview in mind attention will now be directed to FIGS. 1A and 1B herein, referred to as composite FIG. 1, which is a schematic flow chart in overall scope of the data processing of the instant invention for effecting the above described operations. The functional blocks 26, 31, and 33, 45, and 68 of FIG. 1 are expanded in the more detailed level flow charts of FIGS. 2–4, respectively.

Beginning at the top of FIG. 1, the bank first transmits to the brokerage central processing unit a record of all transactional information for each of the system subscribers, together with subscriber identification. Thus, each entry will include a subscriber identification, and transactional information such as a transaction card charge or credit (e.g., credit for returned charged merchandise) or a check identification and amount (functional block 10). A cross reference file 13 is maintained at the brokerage central processing unit of system subscribers, this being updated by manual or automatic entries 12. The incoming transactional information from the bank is verified at functional block 14. The verification assures (i) that the reported transaction is for a subscriber who is in fact known to and authorized by the system; and (ii) it verifies transmission and accuracy of the incoming information—e.g., by the per se well known system of verifying totals across batched lots of fixed, predetermined size of incoming transactional records.

Most typically, the verification will prove out ("NØ" output of "OUT-OF-BALANCE" test 15), and system flow passes to the next following test 20 to assure that the customer is identified in the master file which also will typically be a test that is satisfied ("YES" output of block 20). If, however, test 15 fails ("YES" output), the OUT-OF-BALANCE total is corrected from a suspense account (block 17), and a printed report of the discrepancy generated (function 18) before passing to the next following customer verification. Similarly, if test 20 fails, a proper identity is created in the Master File for the customer whose transaction is being processed, and system flow passes for succeeding operations. Finally for initializing processing, manual transaction entry 22 is employed to correct items needing manual intervention to account for errors, fraud items, stolen checks, or the like.

Following such reception and verification of incoming items, the received transactional information is employed in functional block 26 to compute or update the then obtaining credit limit for each customer. As above noted, the functions performed by the block 26 are set forth in expanded detail in the flow chart of FIG. 2 discussed below. In brief terms at this point, it is the office of processing for block 26 to provide a credit limit computational variable CRDLT(I) which is the credit remaining available to each of the I customers or subscribers to the system. That is, CRDLT(I) is the amount of credit remaining to the I-indexed customer for use of his transaction card and checks. This credit limit CRDLT(I) is reported for each customer to the bank for purposes of honoring charges, checks, credit advances and the like. For convenience and conciseness of presentation, all indexed variables (such as CRDLT(I) above discussed) are sometimes shown without their index. It will readily be appreciated that all per-subscriber variables are in fact so indexed. Further for ISA processing set forth below, doubly indexed variables (I-for subscriber; J-for bank) are utilized.

The functional block 26 is supplied with all customary brokerage data stored in a brokerage account data file 27. The particular ensemble of variables supplied to the credit limit computational processing 26 via file 27 are set forth in detail below in conjunction with the FIG. 2 expanded presentation of credit limit computation. In very brief terms, they include such as the short term (e.g., ISA and/or money market) investment position of each subscriber, the worth of his securities in the brokerage account, margin buying or loan power, and the like. The file 27 is as above noted maintained in the customary fashion in the brokerage house to reflect the customer's status. As one additional external entry (functional block 28), the short term investment dividends and interest earned for the customer is periodically reported and reflected at the customer's storage in the account data file 27.

As part of credit limit updating, the customer's account is examined for an overdraft condition (test 31). Overdraft examination and processing is also set forth in detail in the FIG. 2 processing. If the customer has overdrawn his account, i.e., overdrawn his "credit limit", a temporary loan is extended to the customer (functional block 33). The customer is notified of the overdraft condition and required to clear the overdraft unless the bank is willing to extend a loan to the customer in a manner de hors his brokerage account and the FIG. 1 system.

Following credit limit functioning, the ensemble of credit limit variables CRDLT are supplied to the bank (function 29). This list of customer credit limits is employed at the bank to limit the credit available in its several forms to each of the subscribers, i.e., to limit the aggregate of usage of the customer charge card, checks and cash advances (via the card or check) which are supportable, from the customer's assets. As a further matter, and as part of the functioning block 26, the credit limit variable also updates each customer's record in the master file (operation 122, FIG. 2).

A history file or stored record is kept of the customer's transactions (block 35) for various purposes, including preserving data to generate periodic monthly statements. Following this, tests 37 and 39 operate on the historical transactional data for the customer to flag possible system abuses, e.g., check "kiting" where deposits are made to obtain money market interest, and the deposited proceeds withdrawn to cover the initial check before it clears. To uncover and prevent repetitive such abuses and others, the tests 37 and 39 respectively determine whether or not three substantial deposits (test 37) or withdrawals (test 39—e.g., card charges, cash advances or checks) exceeding some predetermined threshold such as $10,000 have occurred within a predetermined time period such as one month. If either

of the tests 37 or 39 is answered in the affirmative, an output report is printed 40 to signal the incidence as a matter for investigation. Thus, for example, a dump of the entire account history might take place for evaluation.

The overall program flow next passes to operation 45 to selectively update the short term investment position (increment or decrement) depending upon whether excess cash has been generated by subscriber transactions and should be placed for short term investment; or whether cash is required for varying purposes. Again, detailed processing for the functional routine 45 is set forth in FIG. 3, which will be described in detail hereinbelow. Accordingly, functioning for the block 45 is discussed only briefly at this point in overview. The processing 45 is supplied with several variables such as manual entries 48 which might reflect monetary deposits by the customer with short term investment buy instructions; is supplied with master file information for all customers at block 49; and is finally supplied with information at block 43 reflecting security transactions (e.g., as part of the per se normal brokerage account data file). The output of update money market position processing 45 are a buy vis-a-vis sell variable for each account, together with the amount to be bought and sold.

As above noted, each system subscriber has the option to participate in one or more of several short term investment opportunities. To this end, test 65 determines whether these customers' excess funds are to be invested in an insured savings account. If they are not, i.e., if the subscriber whose account is then being processed has opted for one or more of the other funds to the exclusion of ISA participation, one or more additional tests 53 determine the proper short term investment money market account for the customer and a report is then generated to the custodian of the appropriate money market trust to reflect the increase/decrease for the subject customer. Thus, for the assumed situation of one taxable and one tax free money market funds (in addition to the insured savings account), if test 53 determines from the subscriber's data block that a tax free (or some other) money market fund has been elected as the customer's primary short term investment vehicle, block 57 issues an appropriate data report to the custodian for the tax free money market trust. Correspondingly, if test 53 notes a taxable trust election by the customer, block 55 issues a data report to the custodian of that trust.

Assuming that block 65 confirms that the customer has opted to have his short term investments in an insured savings account (i.e., money market deposit ("MMDA") account insured by the Federal Deposit Insurance Corporation, or Federal Savings and Loan Insurance Corporation, test 65 supplies a "YES" determination. There follows one or more functional block 68(J) associated with the processing of the subscriber's short term investment at that specific (J-th) bank. More specifically, by government regulation, there is a limit (currently $100,000) on federal insurance for the money market deposit account at any one banking institution. Accordingly, for each system subscriber there is an ordered hierarchy of banks in which the subscriber's short term investment is placed such that the subscriber deposits do not exceed the $100,000 limit in any institution. Thus, for subscribers with less than $100,000 in short term investable funds, only one bank need be involved such that only one functional block 68 is invoked for that subscriber. As the subscriber's deposit grows near or above the insurance threshold (preferably with a margin as discussed below), other functional blocks 68 associated with other banks are called upon. Suffice it for present summary description purposes, the incremental funds to be added to or removed from the customer's insured money market deposit account(s) are accommodated by iterative operation of one or more of the similar bank processing functional routines 68. As part of such processing, reports are generated to the respective institution(s) for deposit/liquidation purposes.

Finally, the short term investment transactions are reported to the account data processing 60 to update each subscriber's account data file; are employed to update the subscriber's master file (61); and are used to update the customer's local data base (step 62) as in his local brokerage office.

That completes the data processing in overview for one complete operation of the system, as for a daily iteration. The next following day, the system will re-execute the functional operations of FIG. 1 employing the new set of operands generated during the day following the previous iteratin in the manner above discussed.

Referring now to FIG. 2, there is shown a detailed flow chart for credit limit updating and overdraft processing corresponding to functional blocks 26, 31 and 33 of composite FIG. 1. It is again the overall purpose of the FIG. 2 flow chart to generate the credit limit variable CRDLT for each of the I-system customers to reflect the remaining available worth of that customer's assets. For purposes of FIG. 2 processing, the following variables (again, all indexed by subscriber but shown without index which remains understood) are employed:

Input Variables	
SMA	Special and miscellaneous value of the customer's account, reflecting the customer's borrowing power based on the securities he holds in his brokerage account. This is measured as the then obtaining percentage of the value of the customer's brokerage assets as established by Regulation T of the Federal Reserve Board. The presently obtaining value, for example, is 50% for common stocks.
FME	Firm maintenance excess of the customer's account representing the customer's borrowing power based upon the brokerage house definition of the loan value of the customer's securities. A typical presently obtaining value might be 70% of the security valuation.
MMKT	The value of the customer's short term investment fund account.
CKS, CRGS, CASHAV, CREDT	The value of the checks, charges, cash advances, and credits respectively, reported by the bank for the interval since the previous processing.
REGTCL	Represents the amount of any Regulation T call against the account.
MNTCL	The amounts of any maintenance call against the account.
CASHBL	This variable represents the cash required for transactions in the customer's securities cash account.

-continued

Output Variables	
CRDLT	As above discussed, this is the credit limit remaining to the customer following all processed transactions.
NLOAN	The new or additional loan increment required for any customer overdraft.

With the above variable definitions in mind, attention will now be directed to the processing of FIG. 2. As a first matter, the value of "today's transactions" (a computational variable TTRAS), i.e., the value of all transactions for the customer for the subject processing day, is computed as the algebraic sum of the checks (CKS), charges (CRGS), cash advances (CASHAV) and credits (CREDTS). A didactic fortran-type statement is

$$TTRAS=CKS+CRGS+CASHAV+CREDTS \quad (1)$$

Test 81 first determines whether either of the special and miscellaneous or firm maintenance excess values for the subscriber (SMA OR FME variables) is equal to zero which would indicate that no customer borrowing power remains in the subscriber's brokerage account, applying the more rigorous of the two standards. Assuming test 81 fails ("NØ" branch) thus signalling that the customer does have remaining borrowing power, test 83 determines whether the Federal Reserve (SMA) or brokerage firm internal (FME) standard is the more stringent and, depending upon the outcome, sets a computational intermediate credit variable CT equal to the lesser of the SMA or FME stored values (steps 88 and 90). A further computational credit limit variable CTR1 is then set equal to the sum of the CT variable (lesser of FME or SMA) plus the sum of the customer's short term investment amount (MMKT),

$$CRT1=CT+MMKT \quad (2)$$

(functional block 92).

The processing variable CRT1 is updated (block 96) to be decremented for amounts due in the account for Federal Reserve Regulation T calls (REGTCL), maintenance calls (MNTCL), the amounts expended in the day's transactions (TTRAS) and the cash balance (CASHBL) due for cash account processing.

$$CRT1=CRT1-[REGTCL+MNTCL+T-TRAS+CASHBL] \quad (3)$$

The variable CRT1 following processing 96 represents a provisional credit limit for the subscriber subject to further processing below discussed.

The above described functioning followed when test 81 noted positive lendable proceeds remaining in the subscriber's brokerage account ("NØ" output of test 81). Assuming there to be no such lendable amount—i.e., where the subscriber has no marginable securities or where they are already fully margined ("YES" output of test 81), test 85 then determines whether customer money market (MMKT) value is greater than zero, i.e., that the customer has a long short term investment position although he has no marginable securities. Assuming this to be the case, test 98 determines whether funds are required of the account to satisfy Regulation T calls, expenditure transactions or the like. If so ("YES" output of test 98), the provisional computation variable for the customer CRT1 is set equal to his money market balance less the amount needed to satisfy fund requirements in a manner analogous to that given above with respect to statement (3), as by:

$$CRT1=MMKT-[REGTCL+MNTCL+T-TRAS+CASHBL] \quad (4)$$

(functional block 105).

The provisional credit variable CRT1 as defined at the output of functional block 96 or 105 is supplied to test 110 to assure that the provisional variable CRT1 is positive. If it is ("YES" output of test 110), the customer credit limit variable CRDLT is set equal to CRT1 (114) thus completing execution of the FIG. 2 processing. If the provisional credit variable CRT1 is not greater than zero ("NØ" output of test 110)—as by debit transactions exceeding the money market and borrowing power of the customer's securities the credit limit variable for the customer is set equal to zero (block 112). Functional block 116 next determines whether or not the customer's transactions TTRAS exceed the absolute value of the provisional credit limit CRT1 and functional blocks 118 and 121 generate a new loan amount NLOAN as the lesser in absolute value of the transactions (118) or provisional credit limit (121). This, again, completes processing for the customer with zero value in CRDLT, an appropriate new loan amount NLOAN being generated.

Continuing with respect to FIG. 2 processing, if the customer has no borrowing power in his securities account ("YES" output of test 81) and has no short term investment value ("NØ" output of test 85), and if he has generated transactions (TTRAS) by using his charge card or checks notwithstanding the absence of anything to support such transactions ("YES" output of test 87), a new loan is established equal to his transactions (step 100), his credit limit is set equal to zero (102), and an exit is made from FIG. 2 processing. As a final mode of FIG. 2 processing, if the customer has a positive money market balance ("YES" exit from test 85), and has no current cash requirements ("NØ" output of test 98), his credit limit is set equal to his money market balance (functional block 103) and exit is made from FIG. 2 processing.

Thus, the above described operation of the FIG. 2 credit limit and overdraft processing (functional blocks 26, 31 and 33 in FIG. 1) computes the credit limit CRDLT(I) for each of the system's customers, i.e., the amount remaining to that customer for use by his charge card, checks and cash advances. Also computed by such processing is the incremented loan value NLOAN(I) to be added to the customer's overdraft.

Referring now to FIG. 3 there is shown a detailed flow chart which executes the updated short term investment position functioning operation 45 of FIG. 1, i.e., determines whether or not short term investments should be increased or decreased and, if so, by what total amount. Such processing involves as variables:

Input Variables	
ACBAL	The available free cash balance of the customer's brokerage account for such as dividends, interest, deposits and so forth.
TOMSET	The amount of securities trades settling the next business day.
DEPYT	The customer's deposits during the period, assumed to be one day,

-continued

	being processed.
IMSTL	Immediate securities settlement items (for example, security redemptions).
CKS, CRGS, CASHAV, CRDTS	The value of the checks, charges, cash advances, and credits respectively, reported by the bank for the interval since the previous processing.
MANBY	The amount of manually entered short term investment buys.
SHTSLM	Short sales in the customer's margin account.
SHTSLC	Short sales in the cash account against securities held by a customer and overdue.
Output Variables	
BUY/SL	Decision to buy or to sell short term investments.
AMT	Amount of short term position to be bought or sold.

Again, it will be appreciated that each of the above variables is actually indexed to reflect each such quantity for each customer. The indexing variable (*I*) has been deleted for convenience.

Referring now to the flow chart of FIG. 3, as a first matter, a processing net present account balance variable ACBAL1 is computed to be the cash balance ACBAL, less funds required to pay for the customer's use of his charge card, checks and the like (ITRA), or to pay amounts due in his brokerage account which are either overdue or which will be settling during the next day (TOMSET), as by

$$ACBAL1=ACBAL-(ITRAS+SHTSLM+SHTSLC+TOMSET) \quad (5)$$

(block 130). In FIG. 3, it is assumed that short term investment purchases will occur only once per week, as on a Friday—and functional block 132 determines whether or not the particular iteration of FIG. 3 processing is taking place at the predetermined, e.g., Friday time. If it is ("YES" output of test 132) and if test 136 confirms that the provisional variable ACBAL1 is positive ("YES" output), processing enters a BUY subroutine. Accordingly, the buy/sell distinguishing output variable BUY/SELL is set to a buy condition (e.g., by loading the variable BUY/SELL with a positive integer—functional block 155), and the amount of short term investment AMT variable is loaded with the provisional sum ACBAL1 (step 157).

Correspondingly, if test 136 provides a "NØ" output signalling that the subscriber charges exceed the surplus funds in his securities account, the data processing enters a SELL subroutine to sell sufficient short term investment assets to obviate the difference or cash requirement (assuming such shares to exist). Test 138 determines whether or not the customer has a short term investment position (i.e., whether MMKT exceeds zero). If he does not, his margin loan is increased (139) and FIG. 3 processing exits. Assuming the subscriber does have a positive short term investment (MMKT) balance, step 140 sets the buy/sell BUY/SELL variable to the sell condition (e.g., a stored negative integer). Test 141 then determines whether the account balance provisional variable ACBAL1 exceeds the short term (MMKT) position and, depending upon the results of the test, the amount (AMT) variable of short term funds to be liquidated is set to the lesser of the money market MMKT (step 145) or ACBAL1 variable (step 143) as appropriate. If all his short term position is sold (145), the difference between what the customer needs and his MMKT amount opens a margin loan transaction (144).

Turning now to the alternate or "NØ" branch of test 132 (which presumes that the current iteration of processing is not the money market buy/sell assumed Friday date), test 133 first determines whether the net account balance ACBAL1 which reflects subscriber expenditures is positive. If it is not, the "NØ" exit of test 133 enters the SELL subroutine above discussed to sell either all the short term position or a lesser amount if that will suffice to cover the subscriber's expenditures and securities requirements. Assuming ACBAL1 is positive, indicating an excess of cash over requirements in a customer account ("YES" exit of test 133), functional block 135 computes a computational variable ITEMS which is the sum of variables representing yesterday's deposits (DEPYT), securities sales settling tomorrow (TOMSET), and immediate settlement items such as redemptions (IMSET) as by

$$ITEMS=DEPYT+TOMSET+IMSET \quad (6)$$

It is desired that the subject proceeds reflected in ITEMS be invested in a short term account immediately and not await the next investment (assumed Friday) date. If such items ITEMS exceed ACBAL1 (test 149) provides a "YES" output; a processing variable INAT is set equal to zero (step 153) and processing enters the BUY subroutine to purchase the requisite savings account balance or money market shares by setting the BUY/SELL variable to the buy condition (155) and loading the AMT variable with the ACBAL1 value. If the immediately investable ITEMS amounts are less than ACBAL1, ACBAL1 is set equal to ITEMS (step 150), the computational variable INAT is set equal to the difference between the processing variables ACBAL1 and ITEMS by

$$INAT=ACBAL1-ITEMS \quad (7)$$

and the BUY subroutine is entered as above discussed. The foregoing processing is required since two ITEMS constituents DEPYT and IMSET are inherently reflected in ACBAL and therefore in ACBAL1 and must not be twice counted.

Finally, functional blocks 158, 159, 160 and 162 accommodate manually entered buy commands. If there is an unprocessed manual buy command as sensed by test 158, test 159 sets the purchase variable ACBAL1 equal to the lesser of INAT (162) or the manual buy (MANBY) (160) and the BUY loop is entered to purchase the appropriate amount (AMT). Once this is done, the next iteration through test 158 will reflect that the manual buy has been processed, at which point the composite processing of FIG. 3 is completed and the "YES" exit of test 158 passes to the exit of FIG. 3.

Turning now to FIG. 4, there is shown in more specific detail system functioning for an illustrative one of the bank processing blocks 68(*j*) discussed in overview above with respect to FIG. 1. To briefly reiterate, it is a principal object of this invention to provide a system arrangement which permits each subscriber to the instant securities brokerage-cash management system to invest his uncommitted monetary assets at his option in money market deposit (MMDA) accounts, i.e., savings accounts at commercial or savings banks, or the like

where those short term investments are protected by insurance from federal agencies. As part of the overall processing it is recognized that the F.D.I.C./F.S.L.I.C. will protect a subscriber at any individual bank for deposits up to a maximum amount set from time to time by governmental edict, e.g., $100,000 at present. Moreover, that amount covers the aggregate of all deposits by the specific customer at the particular financial institution, to include certificates of deposit as well as MMDA amounts. Accordingly, processing for the instant invention allots a maximum of $97,500 to any specific institution for all of the customer's deposits, permitting an incremental amount ($2,500 for the assumed strategy) for account growth by way of interest.

Moreover, financial institutions are allotted to customers on a hierarchal, ordered basis such that customer deposits fill a first (highest priority) institution up to the allotted $97,500 before opening an account with a second, next highest priority institution and so forth. Alternatively, input apparatus **161**, e.g., a manually operated keyboard, can enter a specific desired bank identification.

Absent overriding manual instructions, subscribers are allotted to banking institutions in accordance with any useful strategy, e.g., by matching a subscriber with banks in a geographically distant location to reduce the probability of customer certificate of deposit relationships with that institution (thus preserving all or substantially all of the $97,500 for MMDA purposes). Banks in the distant area may be pre-assigned to customers in a fixed, predetermined hierarchy; or may be assigned on a probablistic basis.

It will also be appreciated that additional monetary restrictions may be accommodated where possible. Thus, MMDA accounts may be characterized by a $2,500 minimum threshold to earn interest at a money market equivalent rate. It is thus desirable to maintain at least that $2,500 sum in all insured savings accounts for each customer even where one or more of the accounts will have less than the system predetermined upper bound, i.e., less than $97,500 while a second, lower priority institution has $2,500 or so on deposit. Finally, it must be recognized that each bank may have a maximum overall participation for all customers (i.e., can usefully accommodate only a certain amount of short term deposits) subject to the constraint that once accepting a deposit from a customer the institution will permit the customer to fill up his $97,500 allotted amount. Other financial strategies and adaptations will be readily apparent without departing from the scope of the present invention.

With the foregoing in mind, data processing variables for FIG. 4 processing include:

Variables	
BAL(I,J)	A doubly indexed variable representing the balance for the insured money market deposit (MMDA) account for the i-th customer in the j-th bank or financial institution.
CD(I,J)	The amount, if any, for certificates of deposit of the i-th customer at the j-th bank.
AVAIL	An intermediate processing variable representing the amount of deposits available to a customer at a bank within the constraints of not exceeding the $97,500 amount.

Referring specifically now to the flow chart of FIG. 4, there is shown an operational flow chart for an illustrative bank processing block 68(J) of FIG. 1 operative in an account opening/increasing mode as when functional block 45 (FIGS. 1 and 3) furnishes an amount AMT to be deposited on behalf of the i-th customer in an insured savings account. Further, a specific (j-th) bank of highest priority for the customer is identified—either by manual input from entry apparatus 161 or automatically on the above-described geographically remote basis. Functional block 162 first determines whether or not the illustrative j-th bank is at or exceeds its maximum, i.e., has all the short term deposits which it desires to receive. If the upper bound is attained or exceeded ("YES" output of test 162), a test 165 determines whether the present balance for the i-th customer (BAL(I,J)) is greater than zero, i.e., determines whether the i-th customer already has an opened account with a non-zero balance at the institution. If not ("NØ" output of test 165), processing flows to the bank next in order (block 68 (j+1) for the j+1st bank) to accommodate the deposit requirements for the i-th customer. However, for the usual case where the subject j-th bank is not at maximum ("NØ" output of test 162), or where the customer already has a balance at the bank ("YES" output of test 165), processing continues within the context of block 68(J).

The next sequence of processing operations 168, 170, 173 and 176 are utilized to assure that a deposit is not made in an institution below the minimum (assumed $2,500) threshold. Test 168 determines directly whether or not the sum of the customer's existing balance (BAL(I,J)) together with the amount to be deposited (AMT) is less than $2,500. If it is not ("NØ" output of test 168) there is no difficulty with the minimum MMDA threshold and processing skips to test 180 below discussed. However, if there is a threshold problem ("YES" output of test 168), $2,500 is borrowed from the customer's next most senior MMDA account institution (the J−1 bank), as by

$$BAL(J-1)=BAL(J-1)-2500 \quad (8)$$

The result of this transaction is communicated to the subject J−1 bank (block 173) and the amount to be deposited (AMT) is increased by $2,500,

$$AMT=AMT+2500 \quad (9)$$

(functional block 176).

Test 180 next determines whether the sum of the amount to be deposited (AMT), the customer's existing MMDA balance (BAL (I,J)) and the certificates of deposit by the customer at that institution (CD(I,J)) exceeds the allotted upper bound, as by program branching depending upon the inequality

$$AMT+BAL(J)+CD(I,J)\ 97{,}500 \quad (10)$$

(block 184). If they do not ("N,Ø" output of test 180), the entire amount to be deposited (AMT) may be deposited in the j-th bank for the i-th customer and this may be effected by

$$BAL(I,J)=BAL(I,J)+AMT \quad (11)$$

An appropriate report is issued to the j-th bank to implement the deposit (block 186) at which point processing returns to block 60 of FIG. 1 above discussed.

If test 180 determines that the full amount to be deposited (AMT) would overflow the insured predetermined limit for the j-th bank ("YES" output of test 180), processing passes to block 181 to determine that partial amount (AVAIL), if any, of the total amount (AMT) which may be deposited in the j-th institution, i.e., the amount by which the total of the customer's balance (BAL(I,J)) and certificates of deposit (CD(I,J)) do not exceed the limit as by

$$AVAIL=97500-BAL(I,J)-CD(I,J) \quad (12)$$

If the available amount (AVAIL) is zero or negative ("NØ" output of test 190), none of the amount to be deposited (AMT) will be accommodated at the j-th bank and processing passes to the j+1 bank to seek investment there. Assuming, however, that AVAIL is positive ("YES" output of test 190), functional block 192 increases the balance at the j-th bank up to the $97,500 limit, as by

$$BAL(I,J)=BAL(I,J)+AVAIL \quad (13)$$

and block 194 decreases the amount (AMT) to be deposited by the funds (AVAIL) taken by the j-th bank,

$$AMT=AMT-AVAIL \quad (14)$$

A report is rendered of the funds (AVAIL) deposited in the j-th bank (block 196) and processing passes to the sequence of operations 68 (J+1) to process the modified amount AMT resulting from step 194.

Thus, the bank processing 68 illustrated for the j-th bank in FIG. 4 may identically recur on a bank by bank basis until the entire amount has been invested or the sequence of banks exhausted (at which point other contingent money market trusts may absorb the remainder). Alternatively, the last bank in the hierarchy being the least most probable for the i-th customer, may simply agree to accept all deposits. While the processing above described has focused on the acceptance of deposits, withdrawals occur in a directly analogous manner, liquidating funds seriatim from the bank having the lowest order priority for the customer up through the highest order until all funds required to satisfy charges have been liquidated. If desired, functioning paralleling blocks 168, 170, 173 and 176 may be utilized to maintain a minimum deposit (e.g., $2,500) at each institution.

The above described composite arrangement has thus been shown to provide an improved securities brokerage/cash management system which supervises and integrates a brokerage account, a charge card, checking, and one or more short term investments which include insured savings accounts, providing great flexibility for the account subscriber, while providing insured earned income for funds not invested or required to satisfy expenditures.

The above described arrangement is merely illustrative of the principles of the present invention. Numerous modifications and adaptations thereof will be readily apparent to those skilled in the art without departing from the spirit and scope of the present invention.

What is claimed is:

1. In combination in a system for processing and supervising a plurality of composite subscriber accounts each comprising a margin brokerage account, subscriber implemented funds withdrawal means, and participation in at least one short term investment including at least one insured savings account, manual transaction entry means, brokerage account data file magnetic storage means for storing current information characterizing each subscriber margin brokerage account, means for receiving subscriber funds withdrawal transaction information, means for generating an updated credit limit for each account operating upon said brokerage account data file storage means and said received subscriber implemented withdrawal transactional information, means for selectively generating short term investment transactions as required to generate and invest proceeds from said subscriber's accounts, and means for updating the short term investment position for said subscriber accounts, said updating means including at least one bank money market deposit account processing means, each of said money market deposit account processing means including test means for rejecting deposits in excess of a predetermined insurance limit-related upper bound.

2. The system as in claim 1, wherein said short term investment available to system subscribers further comprises money market trust means, and means for allotting funds between said money market trust means and said insured savings account.

3. A combination as in claim 1 or 2, wherein said subscriber implemented funds withdrawal means includes checking account means.

4. A combination as in claim 3, wherein said subscriber implemented funds withdrawal means further comprise credit card means.

5. A system as in claim 3 further comprising means for generating a subscriber loan record when the subscriber's aggregated expenditures exceed the value of the short term investments and securities loan value as reported by said brokerage account data file means.

6. A system as in claim 1 or 5, wherein said system includes plural of said bank money market deposit account processing means, said plural money market deposit account processing means being in an ordered hierarchy, each of said money market deposit account processing means including means for providing deposits which attain or exceed a minimum predetermined threshold bound for each of a corresponding ordered hierarchy of bank institutions for which any subscriber maintains a money market deposit account.

7. A combination as in claim 1, 5 or 6, wherein each of said bank account processing means include report generating means, and means responsive to a deposit in excess of an account upper bound for apportioning said deposit among plural money market deposit accounts to not exceed such limit.

8. A combination as in claim 1 or 2 futhter comprising means for generating a stored record of each subscriber deposit and subscriber implemented funds withdrawal transaction, and means for providing an output alert record responsive to either of said deposits, or the subscriber implemented withdrawals exceeding predetermined pattern norms.

9. A system as in claim 1 or 2, wherein said updated credit limit generating means comprises means for accu-

mulating the amount of charge card usage and checks for each subscriber, means responsive to said brokerage account data file means for generating a subscriber updated credit limit measured by the difference between the limiting residual subscriber brokerage account securities loan value augmented by the value of the subscriber's short term investment, decremented by the value of the subscriber's aggregate expenditures and funds required for brokerage account purposes, means for reporting said updated credit limit to said brokerage account data file means.

10. In combination in a system for processing and supervising a plurality of composite subscriber accounts each comprising a margin brokerage account, subscriber implemented funds withdrawal means, and participation in at least one short term investment including at least one insured savings account, manual transaction entry means, brokerage account data file magnetic storage means for storing current information characterizing each subscriber margin brokerage account, means for receiving subscriber funds withdrawal transaction information, means for generating an updated credit limit for each account operating upon said brokerage account data file storage means and said received subscriber implemented withdrawal transactional information, means for selectively generating short term investment transactions as required to generate and invest proceeds from said subscriber's accounts, and means for updating the short term investment position for said subscriber accounts, said updating means including at least one bank money market deposit account processing means, each of said money market deposit account processing means including test means for rejecting deposits in excess of a predetermined insurance limit-related upper bound wherein money market deposit account processing means includes means for storing a maximum program savings account deposit limit for each participating institution, and means for precluding deposits to customers not already having a money market deposit account at a specific institution responsive to that institution's stored deposit limit being exceeded.

11. In combination in a system for processing and supervising a plurality of composite subscriber accounts each comprising a margin brokerage account, subscriber implemented funds withdrawal means, and participation in at least one short term investment including at least one insured savings account, manual transaction entry means, brokerage account data file magnetic storage means for storing current information characterizing each subscriber margin brokerage account, means for receiving subscriber funds withdrawal transaction information, means for generating an updated credit limit for each account operating upon said brokerage account data file storage means and said received subscriber implemented withdrawal transactional information, means for selectively generating short term investment transactions as required to generate and invest proceeds from said subscriber's accounts, and means for updating the short term investment position for said subscriber accounts, said updating means including at least one bank money market deposit account processing means, each of said money market deposit account processing means including test means for rejecting deposits in excess of a predetermined insurance limit-related upper bound wherein said system includes plural of said bank money market deposit account processing means, said plural money market deposit account processing means being in an ordered hierarchy, each of said money market deposit account processing means including means for providing deposits which attain or exceed a minimum predetermined threshold bound for each of a corresponding ordered hierarchy of bank institutions for which any subscriber maintains a money market deposit account.

* * * * *

APPENDIX 2

EXHIBITS

Exhibit A – Mukerjee *et al.*

Exhibit B – Musamanno *et al.*

Exhibit C – Bodie

Exhibit D – Williamson *et al.*

Exhibit E – Markman Order, U.S. District Court for the Western District of Texas

APPENDIX 1

PENDING CLAIMS

1. An investment system for providing an improved capital structure for an institution comprising:

means for establishing data representative of at least one deposit account for a term, the deposit account having a deposit principal component and a deposit accrual component, the deposit accrual component having a fixed interest component and a variable interest component; and

an account management data processor for servicing the deposit account over the term, including:

means for determining the rate of inflation;

means for adjusting the amount in the deposit accrual component in a manner responsive to the rate of inflation;

means for retiring the fixed interest component by a first schedule over the term; and

means for paying the deposit principal component according to a second schedule over the term.

2. The system of claim 1, the account management dataprocessor further including means for retiring the variable interest component by a third schedule over the term.

3. The system of claim 2, wherein said first, second and third schedules are the same schedule.

4. The system of claim 1, wherein the deposit principal component paying means comprises means for making a lump sum payment at the end of the term.

5. The system of claim 1 further comprising:

means for establishing data representative of at least one loan account for a term, the loan account having a loan principal component and a loan accrual component; and

the account management dataprocessor further including

means for determining the amount in the loan accrual component in a manner responsive to the rate of inflation; and

means for retiring the loan account over the term.

6. The system of claim 5 wherein the loan account retiring means comprises means for retiring the loan accrual component by a first schedule over the term and further comprises means for retiring the loan principal component by a second schedule over the term.

7. The system of claim 5, the account management dataprocessor further comprising means for enhancing the loan principal component responsive to the loan accrual component and wherein the loan account retiring means comprises means for retiring the principal component by a schedule over the term.

8. The system of claim 5 wherein the loan accrual component comprises a fixed interest component and a variable interest component.

9. The system of claim 8, the account management data processor further comprising:

means for enhancing the loan principal component in a manner responsive to the variable interest component; and

wherein the loan account retiring means comprises:

means for retiring the fixed interest component by a first schedule over the term; and

means for retiring the loan principal component by a second schedule over the term.

10. The system of claim 8, the account management dataprocessor further comprising:

means for enhancing the loan principal component in a manner responsive to the variable interest component; and

wherein the loan account retiring means comprises:

means for retiring the fixed interest component by a first schedule over the term; and

means for retiring the loan principal component by amortization over the term.

11. The system of claim 10 wherein the means for retiring the fixed interest component by a first schedule over the term comprises means for reducing the amount in the fixed interest component by a predetermined portion at preselected iteration periods.

12. The system of claim 11 wherein the means for retiring the loan principal component by amortization comprises means for retiring a portion of the loan principal as determined by the formula: ##EQU5## wherein R=the portion retired; A=the amount of the deposit principal; and

PVIF is defined as ##EQU6## wherein N is the number of iteration periods remaining +1, and i is a fixed interest rate.

13. The system of claim 12, wherein the amortization comprises a lump sum payment at the end of the term.

14. The system of claim 5 wherein the loan account is a mortgage account.

15. The system of claim 5 wherein the means for adjusting the amount in the loan accrual component in a manner responsive to the rate of inflation comprises means for multiplying the loan principal component by the rate of inflation when said rate reflects a positive rate of inflation.

16. The system of claim 1 wherein the means for determining the rate of inflation comprises a consumer price indexing means.

17. The system of claim 1 wherein the deposit account is a certificate of deposit account, bond account or annuity account.

18. The system of claim 1, the account management dataprocessor further including means for enhancing the deposit principal component in a manner responsive to the variable interest component by multiplying the deposit principal component by a variable interest rate and adding at least a predetermined portion of their product to the deposit principal component.

19. The system of claim 1 wherein the means for adjusting the amount in the deposit accrual component in a manner responsive to the rate of inflation comprises means for multiplying the deposit principal component by the rate of inflation when said rate reflects a positive rate of inflation.

20. The system of claim 1 wherein the means for retiring the fixed interest component by a first schedule over the term comprises means for reducing the amount in the fixed interest component by a predetermined portion at preselected iteration periods.

21. The system of claim 20 wherein the means for paying the deposit principal component according to a second schedule comprises means for paying a portion of the deposit principal by amortization as determined by the formula: ##EQU7## wherein R=the portion paid; A=the amount of the deposit principal; and

PVIF is defined as ##EQU8##

22. The system of claim 21, wherein the amortization comprises a lump sum payment at the end of the term.

23. The system of claim 1, wherein the means for adjusting the amount in the deposit accrual component in a manner responsive to the rate of inflation comprises means for multiplying the deposit principal component by the rate of inflation when said rate reflects a positive rate of inflation.

24. In combination, in an investment system for managing inflation risk:

means for establishing data representative of a deposit account with an institution, the deposit account having a principal component representing the cash investment of a depositor for an account term, and an accrual component comprising a fixed interest component which is enhanced at a fixed interest rate times the principal component and a variable interest component which is enhanced at an index responsive to the rate of inflation times the principal component; and

an account management dataprocessor including means for paying the deposit account over the term.

25. The combination of claim 24, the account term being divided into a plurality of iteration periods.

26. The combination of claim 25, the fixed interest component for the current iteration period being enhanced additionally at a fixed interest rate times the accrual component for the previous iteration period.

27. The combination of claim 25, the variable interest component for the current iteration period being enhanced at an index responsive to the rate of inflation of the accrual component for the previous iteration period.

28. The combination of claim 25, the fixed interest rate being compounded continuously.

29. The combination of claim 24, wherein the deposit account comprises a bond account, a certificate of deposit account, or an annuity account.

30. The combination of claim 24, the principal component being constant over the account term and retired at the end of the account term by a lump sum payment to the depositor.

31. The combination of claim 24, the principal component being retired over a plurality of iteration periods in the account term by payments to the depositor in each iteration period.

32. The combination of claim 24, the accrual component being retired over a plurality of iteration periods in the account term by payment to the depositor in each iteration period.

33. The combination of claim 24, the index corresponding generally to the consumer price index.

34. The combination of claim 24, the deposit account being used to finance property of the institution.

35. The combination of claim 24, the deposit account being secured by property of the institution.

36. A system for managing deposit and loan accounts, comprising:

means for establishing data representative of at least one deposit account for a term;

means for establishing data representative of at least one loan account for a term, the loan account having a loan principal component and a loan accrual component, the loan accrual component having a fixed interest component and variable and variable interest component; and

an account management dataprocessor for servicing the accounts over the term, comprising:

means for adjusting the amount in the deposit account in a manner responsive to the rate of inflation;

means for paying out the deposit account;

means for determining the amount in the loan accrual component in a manner responsive to the rate of inflation; and

means for retiring the loan account over the term, including

means for retiring the fixed interest component by a first schedule over the term, and

means for retiring the loan principal component by a second schedule over the term.

37. The system of claim 36, the account management dataprocessor further comprising means for retiring the loan variable interest component by a third schedule over the term.

38. The system of claim 37, wherein said first, second, and third schedules are the same schedule.

39. The system of claim 36, wherein the means for retiring the loan account permits prepayment of the loan account.

40. The system of claim 36, the account management dataprocessor further comprising means for enhancing the loan principal component in a manner responsive to the variable interest component by multiplying the loan principal component by a variable interest rate and adding at least a predetermined portion of their product to the loan principal component.

41. The system of claim 36, wherein the means for determining the rate of inflation comprises a consumer price indexing means.

42. The system of claim 36, wherein the deposit account is a certificate of deposit account, bond account, or annuity account.

43. The system of claim 36, wherein the loan account is a mortgage account.

44. The system of claim 36, the deposit account having a deposit principal component and a deposit accrual component wherein the means for paying out the deposit account includes means for paying out the deposit principal component by a schedule over the term and means for paying out the deposit accrual component by a schedule over the term.

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INDEXATION IN AN INFLATIONARY ECONOMY

A CASE STUDY OF FINLAND

Santosh Mukherjee
and
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One of the authors of this broadsheet has been a member of the team of examiners appointed to conduct a review of Finland's n policies. In that context as well as more directly in relation to the pr of this broadsheet many public servants, industrialists and tra representatives have given information and comment with quite re generosity. To all of them the authors are deeply indebted. A ver acknowledgement is due to Pauli Snellman, the International Sec the Ministry of Labour in Helsinki, who took great pains over i interviews for the second author with some extremely busy and kr able people.

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VI Finnish bank deposit accounts

The division of the Finnish banking system into commercial savings, co-operative and Post Office groups was described in Chapter IV. With an undeveloped stock market, a deposit account at one of these banks is often the only place a Finn can find to put his savings. Terms governing bank deposits are therefore an important influence on the savings of the household sector.

Five-year gestation

As the rapid inflation of 1950–1 was being checked by the stabilisation programme begun in October 1951, the banks took the decision, in principle, to adjust both their loans and deposits for inflation, on the basis of quarterly inspections of the cost-of-living index. The principle was examined by the joint body of Finnish financial institutions in 1950 at the initiative of the chairman (Rainer von Fieandt)* of the board of the large commercial bank Oy Pohjoismaiden Yhdyspankki (Ab Nordiska Föreningsbanken).

The banks claimed to be motivated by two desires: to promote economic justice and to protect the growth of their deposits. The new system was to come into being at the beginning of 1952, and a working party was set up by the joint standing committee of Finnish financial institutions to study the practical details. Finnish bankers are as cautious as any, and index-linked accounts were not launched until 3½ years later.

The initial idea had been to apply an extra charge to all loans equal to half the rise in the index, and then to use the funds to compensate all depositors for half their loss due to inflation. What was eventually decided was different and more complex. Not all deposits were index-linked, but only specifically designated accounts carrying certain restrictions on withdrawal. Full inflation proofing was given to these designated accounts. The money needed to make them keep pace with the cost of living was found by imposing an 'index surcharge' on *all* loans. The amount of the surcharge was usually fixed according to the proportion of the bank's deposits benefiting by index adjustment, so that the bank could just balance its commitments. (See Chapter IX.) This was of course less disadvantag borrowers than the initially envisaged scheme, so long as not mo half the funds on deposit were index-linked. In fact, it was only d short-lived peak of popularity, in 1968, that index-linked accounts anywhere near to half of all deposits. Until then a quarter had b maximum. When these figures are considered it should be borne i that only a fraction of total deposits are genuine savings. One estimate is that 75–80 per cent of money banked is effectively on account.

Birth and infancy

The first index-linked bank account was opened on 2 May 1955. Thi time when retail prices had been very steady for several years. Wi authorities knew that this stability was fragile and that inflation coul loose again at any time, to the general public there can have seem point in the new arrangement offered by the banks.

The accounts were in four respects less favourable than ordinary accounts. A lump sum of 30,000 markka (about 1972 £80) was requ open an index-linked account: such an initial deposit was not requi an ordinary account. Secondly, no withdrawals could be made fo year from an index-linked account, whereas an ordinary deposit could be closed within six months and 100,000 markka might be from it each month. Thirdly, the interest on index-linked deposits w percentage points below that for normal deposits. Lastly, Inde deposits did not share the privilege of tax exemption that ordinary enjoyed.

The mechanism of index compensation worked in the followin Once the cost-of-living index (October 1951 = 100) had risen 2 point 104, the capital was increased by as many full 2 per cents as the inc risen between deposit and withdrawal. The figures used were the a (to the nearest whole number) of the index values for the three before deposit and withdrawal respectively. The system did not w other way: no reduction would take place if the index fell.

From May to the end of 1955 the facility remained available but pra unused. The first step of indexed compensation was only to be take the cost-of-living index reached 106. Throughout 1955 the index staye in the neighbourhood of 100 (in fact, it was below 100 until August). the first five months of their existence about 260 million markka (abo £700,000) were placed in indexed accounts. While this was ha ordinary savings accounts grew by 8,700 million markka to 295,000 markka—more than a thousand times the total of index-linked depo 1 July 1955 index-linked accounts were made comparatively ev attractive by a ½ point rise in the interest rate on non-indexed depc

Index-tied accounts had been introduced simultaneously in al institutions except for one large savings bank, Helsingin Työväen pankki (now Suomen Työväen Säästöpankki). At first the commercia captured most of the funds on index-tied accounts, as was only na

*Mr von Fieandt later became Governor of the Bank of Finland, and was Prime Minister for five months in 1957–8. After this he represented Finland at the IMF and the IBRD.

view of their dominance of the money market. But in December 1955 all commercial banks (but not the savings banks or cooperative societies) throughout Finland, and all types of bank in Greater Helsinki, stopped accepting new deposits on index-tied accounts. As the accounts opened earlier in commercial banks came of age and were closed down, the savings banks came to hold more than half of all index-tied deposits, even though they had only about 40 per cent of total deposits. The cooperative credit societies at this time had 40 per cent of index-tied funds, though a mere 20 per cent of total deposits.

At the beginning of 1956 a sudden burst of inflation caused index compensation to be paid out for the first time—the actual payments were made in June. During 1956, index-tied deposits received the same regular interest as did ordinary deposits. Depositors now started to show more interest in indexed accounts. The sum deposited grew steadily throughout 1956, and the commercial banks had second thoughts about rejecting this line of business. In January 1957 they offered indexed accounts again, and rapidly regained 30 per cent of the market. By then index-tied deposits were increasing at such a rate that, despite the commercial banks' incursion, the index-tied totals at the savings and cooperative banks continued to grow. By contrast the total of all bank deposits was at the time decreasing.

In January 1957 a choice of two kinds of index-tied account became available to the public. In addition to the old conditions of 100 per cent index compensation on a taxable (now called 'A') account, 'B' accounts were offered. These were tax free (like non-indexed deposit accounts) but gave only 50 per cent index compensation. 'B' accounts achieved instant popularity, and within a year of their introduction accounted for 44 per cent of all index-tied deposits. They were given a further boost early in 1958 when the banks gave customers the opportunity to avoid a proposed advance collection of income tax on 'A' index premia by switching their money from 'A' to 'B' accounts. In April 1958, 72 per cent of all index-tied deposits were held in the 'B' accounts.

September 1958 marked the peak of the first phase of popularity for index-tied bank accounts. They had passed one quarter of all deposits. By this time the bout of inflation that had made them attractive was over. A decline of the index-tied total set in. In January 1959, 'A' accounts were discontinued, and for the next five years practically all index-tied accounts were of the 'B' type, tax free but with only 50 per cent protection against inflation.

Rivals

Expansion of index-linked deposit accounts as a method of saving was much affected by competition from various alternatives at different times. Initially their growth was impeded by a strong sale of government bonds. The 5 per cent bond loan for public subscription of May 1955 promised full index compensation on the same terms as the indexed bank accounts that were introduced that month. The deposits received interest at 4½ per cent. While ½ per cent less interest might have appeared a fair price to pay for the

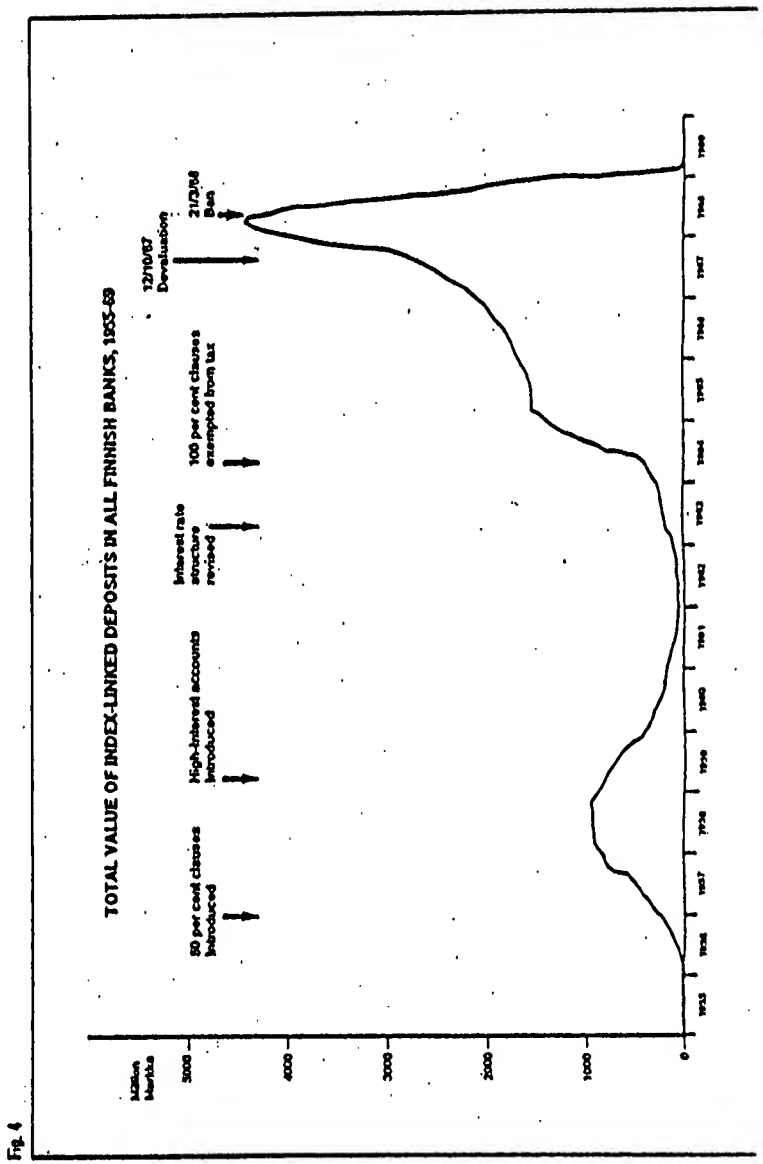


Fig. 4

greater liquidity of the bank deposits (a one-year rather than five-year maturity), against that the return on the government bonds was tax free. Ordinary savings at banks were exempt from tax on the grounds that the government wished to make up to the saver his loss through inflation. Logic required that interest on index-linked deposits, already inflation-proofed, should be liable for tax like any other income.

It did not escape the banks that this line of logic implied that the return on indexed government bonds should also be taxed. Discussions between the financial institutions and the government brought about agreement (at the end of 1956) on some changes. The interest margin between bank deposits and bonds was narrowed by half a percentage point. More significantly, deposits and government bonds were both to be subject to the same tax treatment. Returns on indexed assets were to be exempt from tax so long as the degree of linkage to the index was not greater than 50 per cent.

It is useful to consider the reasoning underlying the widespread use of a 50 per cent index clause by the Finns. At first glance it appears a half-hearted way to protect people from inflation. It is tempting to think that if there is to be an index clause at all it might as well do the job properly. Cynics have explained 50 per cent protection as the average of the rates put forward by keen advocates and outright opponents of indexing. Certainly it is in large part a product of compromise. But there is some economic justification. In the first place, it cuts down to a negligible size the risk of accelerating the inflationary spiral (see Appendix A). Secondly, it reduces fluctuations in the rate of return. The holder of a 50 per cent indexed asset has the equivalent of a ready-made investment portfolio, half in fixed-interest deposits and half fully indexed.

To take advantage of the parity of tax treatment agreed with the government at the end of 1956, the banks introduced a new type of indexed account. 'B' accounts had 50 per cent index clauses and, in accordance with the latest ruling, were tax free. But for protests from the savings banks, the commercial banks would have let these accounts take over entirely, cancelling the former 100 per cent inflation proofed but taxed type. The savings banks, however, insisted on keeping full protection for the small saver, who fared better under the old arrangement because of his low marginal tax rate. (The two types of indexed account in fact were available at the same time for a total of only five years out of the thirteen for which one or other existed.) Government bonds from this time on used index clauses only of the 50 per cent variety.

'A' and 'B' accounts at first carried the same basic rate of interest, 4½ per cent. In January 1957, when 'B' accounts started, the index clause for 'A' accounts was made more sensitive. Compensation was now to be paid for full 1 per cent changes in the cost-of-living index, instead of full 2 per cents. 'B' accounts received exactly half the index-related compensation rate paid on 'A' accounts. It was at this time that the commercial banks and institutions in Helsinki which had stopped accepting indexed deposits a year earlier came back into this business again.

Early in 1957 Finnish bank deposits received the highest gross nominal

returns ever given up to that time. For two months, 'A' accounts re interest (that is, basic interest plus index-based payment) of 18½ pe A year later they were still getting 12½ per cent, and 'B' accounts receiving 8½ per cent, tax free.

Late in 1958 the pace of inflation slackened, and index-tied de began to fall off. From 1 January 1959 deposits were no longer ac on 'A' accounts, which by this time had fallen to under a quarter indexed deposits. In the spring and early summer of 1959 the banks o two new alternatives to indexed accounts. 'High-interest' accounts o a steady 5 per cent (to be compared with the 3½ per cent current basi on indexed accounts). The period of deposit was 12 months, the as for indexed accounts. The second kind, 'tax-concession' accounts immunity from taxation to funds held in them for at least three years a maximum on the tax saving of 80,000 markka (about 1972 £150).

Tax-concession accounts presented no real threat to index- accounts. They collected no more than 150 million Markka (perhaps cent of total deposits) and died out altogether at the end of 1963. interest accounts, on the other hand, grew rapidly at the expense of linked deposits. Index linkage was of little value to depositors from to 1962. For most of this period price changes were small enough to index premia to 1 per cent or less, keeping the yield on 'B' accour 3½–4½ per cent, well below what was available on high-interest acc The latter consistently held a good 10 per cent of all deposits. A mo form of these high-interest accounts was the natural choice of most de ors in index-linked accounts when those were abolished in 1968.

Earlier, index-linked accounts won against another potential rival stock exchange suffered a severe decline in 1956 because of the adv a new type of real-value asset.

Rise to fame

On 1 June 1963 a new interest rate agreement came into force. Its pu was to further differentiate the interest rate structure on various typ deposits without altering the overall average rate. Among its prov was an increase in the interest rate on high-interest accounts from 5 per cent. The rate on 50 per cent index-tied deposits was lowered fron 3½ per cent. 100 per cent index-tied accounts, unavailable since 31 Dec 1958, were offered again, at 3 per cent interest; these remained s to taxation.

At the beginning of 1963 index-tied deposits had already started to r In May 1964 they reached about six times the level at which the stagnated in 1961–2. Then in a single month they leapt up by more thar The reason for this was a piece of legislation which was later to be 'the fatal flaw' in the Finnish system of index clauses. It freed all inde deposits from taxation. Holders of high-interest accounts and ol indexed accounts of either 'A' or 'B' type were permitted to transfer savings to new-style tax free 100 per cent indexed 'A' accounts. The so rapidly, in large numbers.

This marked the beginning of a dramatic rise in the sum deposited on indexed accounts. Their total increased tenfold in four years; an average annual growth rate of 78 per cent. To some extent this can be explained in terms of the increasing rate of inflation, and people's growing awareness of their need of protection. The rate of increase of deposits certainly slackened in 1965–6 when inflation was less severe. But a fundamental change in the structure of the money market was in progress. Earlier there had been substantial tax concessions to encourage the building of private houses. These were being phased out, and capital that might have gone into new housing found its way instead into index-linked deposit accounts. Their new tax status had made them the most attractive financial asset in Finland.

'B' accounts suffered a death blow when 'A' accounts were freed from tax. The 1·1½ points extra interest which they offered enabled them to survive for another three years, but they tapered off completely at the end of that period.

The devaluation of October 1967 brought about the final explosion in index-linked deposits. Correctly expecting a sharp price rise, depositors shifted nearly all their long-term savings into index-linked accounts. 1,500 million Markka (about 1972 £200 million) flowed into these accounts in the space of six months.

Sudden death

In March 1968 a stabilisation agreement was signed by the central trade union and employer organisations. (See Appendix D.) Designed to quell the post-devaluation price surge, this traded wage restraint for price control. Among its provisions was the abolition of the system of index linkages for wages, rents, business contracts, bonds and bank deposits. The index clause was not to be applied to bank deposits after 30 November 1968.

Even more suddenly than they had sprung to prominence, index-tied deposits fell. A year later, all the money formerly in indexed accounts had left them. Most of it went straight to one of the high-interest accounts. New six and twenty-four month accounts offering 4½ per cent and 6 per cent interest respectively were available from 1 March 1969, as well as the old twelve month accounts which now gave 5 per cent. One outcome of the life and death of indexed bank deposits was that the share of long-term (at least one year) deposits in total deposits was much increased. Before the index-linked boom, at the end of 1963, this share had been 13 per cent; in February 1969 it reached 34 per cent.

VII Bonds issued by Finnish government or industry

Background of indexation of bonds

For background to the substantial government index bond issues of middle fifties one needs to go back to 1945. In that year indemnity b were given by the government to Karelians who migrated from the *r* more than one-tenth of Finnish territory which had to be ceded to the S Union.

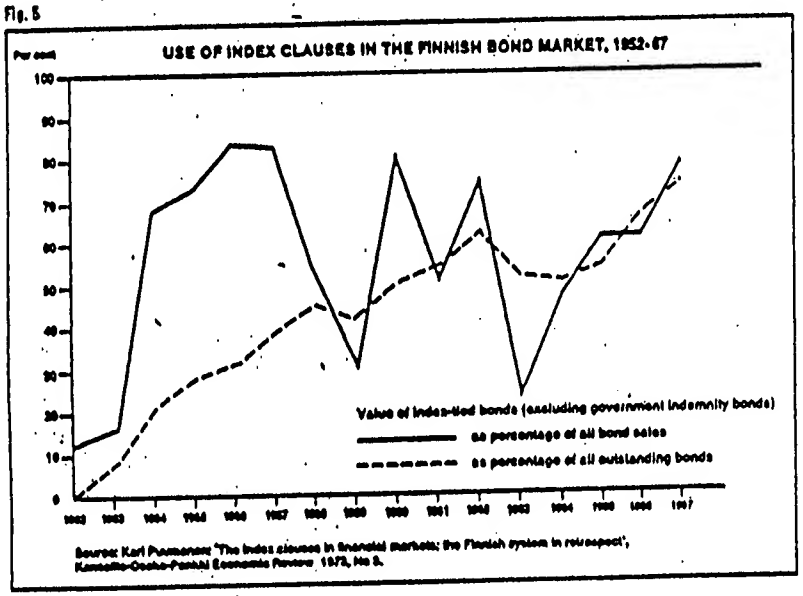
Wherever possible, the Karelians' losses were made good in kind: far were given land, fishermen lakeside sites and house-owners building p Where individuals had lost stock and shares they were given similar hold in large companies or state undertakings. Most small claims were se in cash. Only when these ways of providing compensation were exhau did the government resort to promissory notes or bonds; nevertheles large part of compensation under the Second Indemnification Act had t in this form.

During 1945–7 the average annual rise in Finland's cost-of-living i was over 43 per cent. In that context it was reasonable that bonds inte to compensate evacuees for their lost property should be inflation proo The method chosen was to increase the principal by 10 per cent for e 10 per cent rise in the domestic wholesale price index. During the ten- repayment period, this index quadrupled; in consequence, some 61 thou million markka were paid out in index-based compensation, on a debt wi nominal value was originally a mere 18 thousand million markka (a 1972 £12m.). Interest was paid at 4 per cent per annum on the cu nominal value; thus, for every £10 of debt in 1944, by 1955 £29 capital £5 interest had been handed over because of the index clause, as wel the original £10 and its £2 interest—in all £46.

Government bonds

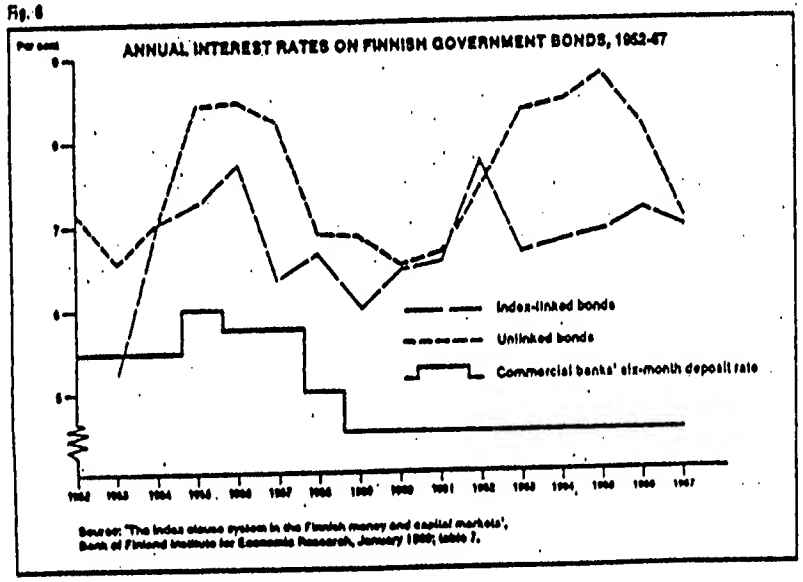
In the late 1950s the Finnish government sold bonds of the order of million markka (1972 £20m.) a year to the private sector; during the 1 bond issues were higher, reaching a peak of over 600 million Markk 1965 and 1966. Most issues were made for buyers such as insurance c panies or banks and designed to suit their needs. Others were available public subscription and thus stood in direct competition with bank dep

Fig. 5



Source: Kari Puumanen: 'The index clauses in financial markets: the Finnish system in retrospect', Kansallis-Osake-Pankki Economic Review 1973, No 8.

Fig. 6



Source: 'The index clause system in the Finnish money and capital markets', Bank of Finland Institute for Economic Research, January 1968; table 7.

accounts, the main repository of the Finns' relatively high level of
savings. Local authorities and firms have also issued bonds, but
government bonds have dominated the long-term capital market thr
the period, and what government has done about index-linking o
swamps the effect of similar moves by the others.

Institutional buyers had need of index-linked securities to enab
to meet their own index-linked obligations to the public. The dema
insurance companies, which had been operating index-linked policy s
ever since 1948, was particularly steady. Banks and cooperative
societies needed the income from index bonds to help pay compe
on indexed deposit accounts. Pension funds similarly had some
finance statutorily index-linked outgoings. The fact that the secondar
in bonds in Finland is very small, original buyers usually holding thei
for ten or more years to maturity, increased the importance of incl
value guarantee in these contracts.

In the month of September in 1953, 1954 and 1955, as the final p
on the index-tied second indemnity loan became due, new index-tie
issues were made for its conversion. Each was paid off over a p
five years, and carried interest at 5 or 5½ per cent per annum. Th
linked to the wholesale price index for Finnish goods, their value c
by as many full 5 per cents (up or down) as the index might have
by the date of amortisation. The government safeguarded itself, h
against incurring a vast liability in the event of runaway inflation by
the index clause invalid once the index had doubled its starting va

Between 1953 and 1968 the government made, on average, four
major bond issues each year with an index clause. Throughout the
sales of these bonds were a substantial proportion of total bond sales,
their market share fluctuated. It shot up from under 20 per cent in
over 80 per cent in 1956 and 1957. There was a drop to under 30
in 1959, and a fresh peak of 80 per cent in 1960. A subsequent de
just over 20 per cent in 1963 was followed by a rise again to 80 pe
1968, when all forms of indexation were abolished. The share of
standing bond loans carrying index clauses rose steadily over the p
reach more than three quarters.

Techniques of index linking

However, the 5 per cent bond of May 1955, issued for public subs
was the only government bond (other than those associated with the
indemnity issues) to carry a full index clause, in the sense that rise
index were to cause matched rises (per cent for per cent) in amo
and interest payments. Recognition of the risk in promising full co
tion led to the writing in of an upper limit of a 100 per cent rise in th
as in the Karelian indemnity conversion loans. A threshold was b
the 1955 bond's index clause, and a delayed first step over the th
index-based premia were not incurred while the index was rising f
to 104, and then the first premium was not to be paid until 106 was
though later premia became due point by point. Repayment was f

five annual instalments, each of equal starting nominal value, and, because of the index link, of equal final real value. The index in question was the cost-of-living index. This was used in all major government index bond issues, with the single exception of the ten-year bonds sold to the National Pensions Institute in April 1963, which had a tie to the wholesale price index for Finnish goods. After the full index link of 1955, this form of inflation-proofing was abandoned in favour of one less attractive to the buyer but safer for the seller. The '50 per cent index clause' meant that a rise of 2 per cent in the index brought only a 1 per cent rise in amortisation and interest payments.

In addition to this return related to the cost-of-living index, ordinary interest was paid on these loans. In many cases the interest rate was fixed for the duration of the loan, a figure between 5 and 8 per cent per annum nearly always being chosen. Also popular with subscribers was a 'variable' interest rate, specified as a given number of percentage points (in practice, 1–3 points) above the current rate of interest offered on six-month deposits at the two largest commercial banks. One large five-year issue, made in four instalments in 1957 for the benefit of private credit institutions, earned interest at half a percentage point more than the current rate on index-linked bank deposits, indicating the sharpness at that time of competition for funds between government and the banks.

The importance of index linking in Finnish government bond issues in 1967–8 is shown by the eleven issues of winter 1967–8. Seven of these, together accounting for half of the total nominal value, carried index clauses. All of that indexation was of the 50 per cent cost-of-living type. The index-linked bonds were of ten, sixteen, or twenty-five year maturity. Non-indexed bonds had much shorter maturities—two or five years. Interest rates ranged from 6¼ to 7¼ per cent per annum for indexed bonds, and were 8 to 8¼ per cent for those without an index clause. Of five issues for subscription by banking institutions three had an index clause; the one issue for insurance companies was indexed. Of the other five (for public subscription) two were index-linked.

Earlier indexed issues of significance included a series of Forest Improvement Loans, whose proceeds were re-lent to forest owners for projects aimed at increasing wood production; this necessarily long-term enterprise was a natural candidate for inflation-proofing. The Labour Pension Funds for farming, lumbering and construction were also large buyers of indexed bonds. The list is completed by the various indexed issues intended for redemption of Tax Payment Certificates; these amounted to very large sums, and are a good illustration of the scope for integrity on the part of government in arranging its finances.

Assessment of benefits to investors

The Bank of Finland Institute for Economic Research has published weighted average annual interest rates on government bond issues with and without index ties, for each year from 1953 to 1967. For the whole of this period the yield spread between indexed and non-indexed bonds in the Bank of Finland's table was much smaller than half the annual perce change in the cost-of-living index. This means that those who were a buy index-linked bonds did significantly better than those who did r part index-linked bondholders paid for this comparatively high returr the longer maturity of their bonds. But probably their gain must be exp mainly in terms of the Bank of Finland's conservative money market ma ment policy.

Mortgage bank bonds

Next in importance to the government in the bond market come the mo banks. But their combined activity has on average amounted to no than about a fifth of government bond issues. Finnish mortgage bank are confined to industrial and agricultural property; private house pur is largely financed by government loans. Three institutions did most of bonds with index clauses: the Industrial Mortgage Bank of F (Suomen Teollisuus-Hypoteekkipankki Oy, STHPO); the Real Estate B Finland (Suomen Kiinteistöpankki Oy, SKPO); and the Land and Ind Real Estate Bank (Maa-ja Teollisuuskiinteistöpankki Oy, MTKPO). E wholly owned by one of the three non-governmental banking gro STHPO by the commercial banks, SKPO by the savings banks and M by the cooperative credit societies.

The most striking difference in the terms of issue between these and government bonds is the variety of indices which they used. nearly all of the government issues were tied to the cost-of-living inde mortgage banks linked their issues not only to that index but use wholesale price index or its domestic subindex, or the export price or the official exchange rate for sterling as alternatives. All links were l to half the change in the index. To compete with government bonds issues had to offer comparatively high rates of interest, since the form the privilege of exemption from tax. Repayment arrangements were to those for government bonds.

Industrial bonds

In each year between 1957 and 1967, private industrial concerns between three and thirty million Markka by means of index-linked From 1962 on, however, unlinked bonds became more prominent, and linking was not of such widespread importance in this sphere as it the world of mortgage and other finance. Industrial bonds tended to rather slowly, but also to have some added attraction, such as twice payment of interest. Where a link was included it was more ofte the wholesale price index than with the cost-of-living index. The inde element was never so strong as to transmit half the change in the frequently a mere quarter was allowed.

Leading industrial index-bondmakers were in the wood manufac industry, engineering works and shipyards (Rauma-Repola Oy) ar Cooperative Wholesale Society. Others who joined in the process we

Finnish Steamship Company, the Northern Power Company, a firm in sulphate, pulp and paper milling (Lohja-Kotka Oy), a manufacturer of oil products (Neste Oy) and the Central Organisation of Agricultural Cooperative Societies.

Local authority bonds

Though local authority bond issue has been small in volume, it deserves mention for two reasons. The City of Helsinki pioneered the way for index clauses in bonds with its 50 per cent cost-of-living link in 1952—a year before the first government index bond, and five years before non-financial companies were first authorised to issue index-tied bonds. In keeping with that pioneering past, practically all local authority bonds brought out in the subsequent fifteen years carried a similar clause. Besides Helsinki, the towns of Tampere, Porvoo, Turku, Lovilsa and Vaasa all borrowed in this way at one time or another.

VIII Social security, pensions and insurance in Finlar

There is a long established Finnish tradition of maintaining the val social security benefits and pensions, both in relation to earned income against rising prices. A similar approach has also been taken to protecting the worth of insurance policies. The method generally ad for this purpose has been a link between these payments and an ind price changes. This arrangement for social security and pension be was thought to be so important that it was exempted from the scope 1968 legislation which prohibited most forms of index linking.

Social security benefits

Finland's old age, disability and widows' pensions are tied to the c living both in relation to the region where the person lives and in ter the year to year changes in prices. The country is divided into three of-living areas'. State pensions have tended to be about 18 per cent those for the cheapest area in the intermediate cost-of-living zone about 35 per cent higher for the area with the highest rating on the The amount paid to the pensioner rises to provide full compensation as as the national cost-of-living index has risen by 3 per cent since the pr adjustment. This system has been in operation since 1957. Unemplo benefits and family allowances are also related to the local cost of liv.

Other social benefits, for example income maintenance during sick have not had direct links with price indices. But being more closel automatically related to earnings (sickness benefit is granted at a rate of 1/450 of the previous year's earnings), they have provided the lent with greater protection against price increases than is available counterpart in Britain.

Occupational pensions

In addition to the basic state pension, all employees receive an oc tional pension from their ex-employer. The 1962 legislation on occupa pensions requires them to be adjusted annually on the basis of the M for Social Affairs' general *earnings* index. Self-employed people are co by a compulsory old-age insurance scheme. Benefits from this schen

are adjusted in step with the general *earnings* index.

The fact that many occupational pensions are based on earnings late in life has meant very large increases for some pensioners. In early 1974 discussions were going on to establish whether these groups were being compensated too generously. An alternative solution being canvassed was a link with the index of *rates* of wages rather than the actual *earnings* index.

Life and accident insurance

Insurance companies in Finland were among the first to see the need for index-linking and to take practical steps in that direction. As early as 1948 they were issuing both risk and endowment policies with cost-of-living clauses. And they still continue to do so. Index-linking is not automatic but offered as an option with all policies. Not surprisingly, it has been taken up by the vast majority of applicants; in 1965 index-linked policies accounted for 99 per cent of all new insurance business.

A straight risk policy can be index-linked simply by index-linking the premia to be paid by the insured. Endowment policies are more complicated to index-link: the insurance company needs to find index-linked investments, in addition to asking the policy holder for an indexed premium. The insurance companies in Finland used much of their income to extend index-linked loans. Generally, a 50 per cent clause was applied for both the loans and insurance cover for the policy holder. Insurance companies were also natural subscribers to government index-linked bonds.

An example of an index clause of a type commonly used in insurance policies is shown on page 65. It stipulates 100 per cent linkage for the first three years (a period during which an individual policy's contribution to the firm's funds is quite small) and 50 per cent linkage thereafter. A contingency clause protects the insurance company against failure to make index-based adjustments. If, for instance, the insurance company is unable to make enough index-linked investments, the index clause in the policy is open to cancellation for the following years (in its application both to premia and to cover). With appropriate foresight, the index clause offered by insurance companies covered the issue of possible legislation to prevent index-linking of policies. In that event, all parties would under the terms of the clause be obliged to accept the rulings of the Ministry for Social Affairs on how to deal with the situation.

The Economic Special Powers Act of 1968 brought about precisely these difficulties. While insurance business was specifically exempted from the general ban on index-linking this was of limited help, for the index-linked investments which had made this kind of business possible were abolished. For a time the companies went on getting index-linked income from existing government bonds and these funds were credited to index-linked policies. By abolishing with profits policies and channelling all surplus funds to keeping up with inflation, the companies have managed to maintain some degree of index-linking.

One exception to the all-pervasive indexation until 1968 was the state

The index clause in Finnish life insurance

Full index clause

1 §. During the next three calendar years from the date of the policy the assu cover (i.e. the sum assured and, if an additional insurance is attached to the the compensation consequently payable) and the premium are adjusted in conn with the cost of living index in the following manner:

(a) The adjustment is effected once a year, at 0 hours on the day when th premium of the calendar year falls due for payment (= the adjustment

(b) The basis of the adjustment is the October cost-of-living index (August July 1939 = 100). The October index of the calendar year immediatel ceding the date of the policy is regarded as the basic index of the policy the October index of the calendar year immediately preceding the adjus time is regarded as the index for adjustment.

(c) Both the assurance cover and the premium will be, starting from the adjus time, as many per cent of their basic amounts (i.e. the amounts witho index clause) as the index for adjustment is of the basic index. The perce thus obtained is, however, rounded off to the nearest smaller whole n but is taken to be 100 were it less than 100.

Half index clause

2 §. After three whole calendar years have elapsed from the date of the p when both the assurance cover and the premium were thus adjusted accordi the third index for adjustment (= interim index) of the full index clause, the ance cover and the premium are adjusted as prescribed under 1 § except th index for adjustment will be taken as the average of the interim index and the Oc index of the calendar year immediately preceding the adjustment time. Howe the interim index is smaller than the basic index, the basic index and not the in index will be used in calculating the average. Assurance cover and the pre are not reduced below the level that would be valid without the half index claus

When the premiums are paid up, the adjustment time is 0 hours on Janu

3 §. If the representatives of the policyholders find at a general meeting company that the company no longer holds index-tied loans or other compa investment property on a scale sufficient for the half index clause in accor with the principle of safeguarding the insured benefits under the Insurance Comp Act, the assurance cover and the premium will no longer during the following cal years be increased according to the half index clause.

If because of legislation it proves necessary to abolish entirely or in part the increases in the loans extended by the company, the question of whether a what extent the increase in the assurance protection resulting from the half clause is to be reduced in consequence will be worked out on the grounds laid by the Ministry for Social Affairs. The index increases received by the company from premiums and from index-tied loans must in this connection be credit the policyholders.

Special stipulations

4 §. If the policyholder requests not later than a month prior to the adjus time that the assurance protection and premium be no longer adjusted accordi the index, the company will consent to it.

5 §. The methods employed in the application of the index clause will be appr by the Ministry for Social Affairs which will also settle any differences of opinion may arise.

Source: Arvo Junnila: *Index Linkage of Life Assurance in Finland*, Helsinki,

insurance scheme against accidents at work. Instead of an index link providing automaticity, every two years a special Act of Parliament has been passed giving cost-of-living supplements to the previous levels of compensation. The scheme is employer financed, though state operated, and this unusual approach could owe something to the employers' organisations' wish to keep their contribution level and cost open to negotiation.

IX Finland: loans with an index clause

The same methods of index linkage cannot always be applied to t saving and borrowing. Protection from inflation for savers is desirable grounds of justice and in order to encourage investment. That outstand debts should rise to match the reduction in the value of money may s be just, but such a system could powerfully discourage borrowing. Vari ways have been tried in Finland to give savers maximum protection with imposing too heavy penalties on borrowers.

One way of going about getting some protection is the 50 per cent in clause, which the Finns have used extensively. Halving the extra amo that has to be paid out to creditors, because of the falling value of mor automatically halves the extra sums needing to be collected from debtors. Another approach is to limit index linkage to a fraction—perh small—of the financial institutions' total liabilities. Indexed inflation proo is clearly of the greatest importance for long-term transactions, and s long-term creditors will prefer fairly high fixed interest (rather than inc ation) if offered the choice.

The National Pensions Institute of Finland started in 1946 to attach in clauses to some of the loans it made to businesses. They were linked to domestic wholesale price index. Half of every loan was repayable in ordinary way and the other half and interest and amortisation fully linke the index. This, of course, is precisely equivalent to a 50 per cent in clause on the whole loan. In those early days there was an expectation the price index could move downwards as well as up; consequently, adj ments of both capital and interest were permitted to occur in both directi In actual fact, of course, there never was any downward adjustment. Tho the Pensions Institute indexed only half of its lending operations it able to pay fully indexed pensions, because the government made g the shortfall in its income.

Insurance companies also began, in 1948, to apply index linkage to t lending operations. Like the Pensions Institute, at first they too used a per cent link with the domestic wholesale price index. Later the ordi cost-of-living index became the more favoured link. Borrowers who into difficulties because of index generated rises in their obligations w allowed to extend their repayment period.

Banks started to make indexed charges on loans when their inde

X Finnish commercial and property contracts

The index linkages discussed so far are those established and operated by the state or large and well-known institutions in the private sector. At times of rapid price increases (and in the absence of price control) business and industry practise, as far as they can, a simple form of inflation-proofing: they raise prices to cover costs. This can be seen as inexplicit index-linking, the implicit index being the particular industry's labour and materials costs. Explicit, formal indexation is only necessary when a market price is not available, or where for some reason the market price is inappropriate. Retirement pensions provide one example, and some interest rates another. Price control by the government can push most product prices into this category by making some cost increases 'non-allowable', as in Britain during part of 1973–4. In that sort of situation producers may be able to benefit by raising prices with reference to a suitable index. Use of an index could also be the best way of preventing haggling about price revisions for long-term contracts.

Indexing in business

Nobody knows precisely the extent to which Finnish businessmen used index-linking in contracts among themselves. But it is certain that the practice was widespread. When a general index was used it was usually the wholesale price index. Particular industries often took the subindex relating to their own products or just the wage earnings part of that subindex.

International agreements were exempted from the 1968 ban in Finland on index-linking. The United Nations Economic Commission for Europe publishes general conditions for the supply of plant and machinery for export. The price revision clause of the set of conditions (formulated in 1955) is given on pp. 71–2. It is an excellent example of the flexibility which can be obtained through a simple indexation formula. First the contracting parties agree on a division of the price into proportions corresponding to materials, labour and fixed costs. They agree on suitable published indices for measuring the variations in the prices of materials and labour. The final price is then calculated from the original by raising the material and labour price components by as much as the indices have risen. This sort of procedure was a widespread feature of Finnish business transactions up to 1968.

Building contracts

Construction projects are particularly vulnerable to cost escalation c their often long lives. Builders cannot always sell at the tender pric stay solvent. Despite the 1968 prohibition, the most recent Finnish la index-linking shows recognition of the special need for rules about adjustment in this sector. It is now possible to link the selling pri buildings 66⅔ per cent to the materials and subcontracts subindex building cost index.

Before the 1968 prohibition, prices of buildings were commonly linked to the building cost index. This resulted in very healthy profi builders, as they gained all the benefit from rising productivity—and rises were rapid. The new arrangement reflects opinion about a equitable distribution of cost increases between builder and buyer.

General conditions for the supply of plant and machinery for export

SUPPLEMENTARY CLAUSE

PRICE REVISION

Should any change occur in the cost of the relevant materials and/or wages the period of execution of the contract, the agreed prices shall be subject to re on the basis of the following formula:

$$P1 = \frac{P0}{100}\left(a + b\,\frac{M1}{M0} + c\,\frac{S1}{S0}\right)$$

where:

P1 = final price for invoicing

P0 = initial price of goods, as stipulated in the contract and as prevailing date of..... (1)

M1 = mean (2) of the prices (or price indices) for (type of materials concc ..... over the period .....

M0 = prices (or price indices) for the same materials at the date stip above for *P0*.

S1 = mean (2) of the wages (included social charges) or relevant indices respect of ..... (specify categories of labour and social charges) over the period .... (3)

S0 = wages (including social charges) or relevant indices (4) in respect same categories at the date stipulated above for *P0*.

a, *b*, *c*, represent the contractually agreed percentage of the indi elements of the initial price, which add up to 100.

($a + b + c = 100$)

a = fixed proportion = ...

b = percentage proportion of materials = ...

c = percentage proportion of wages (including social charges) = ...

Where necessary, *b* (and if need be, *c*) can be broken down into as partial percentages (*b1*, *b2*, *b3* ..... .) as there are variables take account ($b1 + b2$ ..... $+ bn = b$).

deposit business became of appreciable size. In the savings and cooperative bank sector this was in 1956. Similar charging arrangements by the commercial banks did not come into operation until rather more than a year after that. This part of the banking sector had interrupted this business for a year, and initially were able to cover indexed payments to depositors with income from their holdings of government indexed bonds.

The Post Office Bank usually tied its loans 25 per cent to the cost-of-living index. All other banks operated on the principle of calculating an index surcharge on all loans at rates just sufficient to cover indexed payments to depositors. This meant, for example, that in a year when the index rose by 10 per cent, a bank with one fifth of its deposits in fully index-linked accounts would place an index surcharge of 2 per cent on all its outstanding loans. The surcharge became payable immediately by borrowers as additional interest; the outstanding debt was not, however, written up.

Bank pools

The proportion of index-linked deposits of course varied from bank to bank. To deal with that the cooperative banks established a pooling system to equalise the loan surcharges among themselves. The cooperative banks' central bank collected twice yearly from all members the proceeds of an index surcharge estimated so as to cover payments on indexed deposits in all cooperative banks taken together.

Initially, the savings banks had no comparable arrangement, each working out the necessary surcharge for itself. In some savings banks the proportion of indexed deposits was quite high, giving rise to a high index charge. In 1964 a pooling system similar to that of the cooperative banks was set up by the League of Finnish Savings Banks and their central bank. The operation began with three quarters of the savings banks as members of the pool. Between them they covered only 55 per cent of all savings bank lending; it was the larger banks in this group which chose not to join.

The other category of Finnish banks, the commercial banks, were all so large that their index surcharges worked out at the same level without any pooling arrangement. Each put its takings from index charges on borrowers in a special blocked account at the Bank of Finland. These balances yielded no interest and could only be used for making indexed payments to the commercial banks' depositors.

Government loans

Large-scale loans to industry were often tied 50 or 25 per cent to the wholesale price or cost-of-living index. In 1958–9 loans were granted to industry from the proceeds of the post-devaluation export levy. These were tied 33⅓ per cent to the exchange rate for sterling.

Loans from the state to individuals generally were not index-linked. Pre-eminent in this category were the very cheap loans available for housing. State loans to students to finance university level studies too carried a low rate of interest and no index charge, unlike their counterparts in Sweden.

Reaction of borrowers

The systems of index-linking loans practised by the banks result very moderate surcharges. Only in 1967, when index deposits rocket they reach 2 per cent. A more typical value was ½–1 per cent. During 63, years of low inflation and few indexed deposits, no index surcharges levied at all.

Borrowers naturally preferred a known rate of interest to an indef variable future liability. But though they might have been reluctant a to accept index linkage of loans, no drop in lending was recorded result of the extent of indexation practised by the Finnish banks an government.

DOCUMENTATION

For the purpose of determining the values of materials and wages, the parties agree to use the following documents as sources of reference:

1. Materials: prices ..... (type of materials)
   (or price indices)
   published by .....
   under the headings .....

2. Wages: wages (including related social charges)
   (or relevant indices)
   published by .....
   under the headings ..... *(5)*

Rules for applying the Clause. In the case of partial deliveries which are invoiced separately, the final price shall be calculated separately for each such delivery.
Period of application of the Clause. The revision clause shall cover the delivery period fixed in the contract, together with any extension thereof granted under Clause 7.2, but shall in no case apply after the date on which manufacture is completed.
Tolerances. Prices shall not be revised unless the application of the formula produces a plus or minus variation of ..... (6)
Saving Clause. If the parties wish the revision formula to be adjusted or replaced by a more accurate method of calculation when the plus or minus variation exceeds a certain percentage, they shall expressly so agree.

(1) It is recommended that the parties should, as far as possible, adopt as the initial price the price prevailing at the date of the contract and not at an earlier date. This is normally the contract price less cost of packing, transport and insurance.
(2) Arithmetical or weighted.
(3) Specify the datum period, which may be defined as part or the whole of the delivery period.
(4) If legal social charges are covered by the index, they need not be taken into account again.
(5) Indices relating specifically to the engineering and electrical industries should be used as far as possible.
(6) State the percentage plus or minus variation which must be exceeded before the formula is applied.

Source: United Nations Economic Commission for Europe, 1955.

Leases and rents

It is generally advantageous for both parties to let land or buildings for a number of years at a time. Property owners are notorious for taking undeserved profits, and for this reason rents have in many countries been the object of statutory control. But rentiers' costs do rise. Indexing is one way of avoiding sudden large and possibly unwarranted increases in rents. It makes possible long-term leases even in the face of unknown future levels of inflation. In Finland land leases of fifty years or more have been allowed to include index clauses since June 1968, only two months after the ban. The law on indexing leases and rents has been further loosened since that time.

It is again hard to know just how many private landlords used indexat Public authorities have always kept their rents at minimum levels. Rents w often frozen, and then raised by the permissible maximum when conti came off. But some landlords certainly did use the cost-of-living index regulate their rents.

2. Wage control:

(a) Wages may be raised in 1968 in accordance with the collective agreements in force or corresponding contracts, however, taking into consideration what has been agreed and decreed concerning the abolition of the index clause.

(b) Wages may be raised in the course of 1969 in accordance with the agreement entered into by the organisations. If there is failure to agree concerning wage provisions at the time the labour contracts or other pay agreements are made, the matter will be referred for decision to the Prices and Wages Council.

(c) The Prices and Wages Council will have a wage section in which central organisations are represented.

Appendix 2 Abolition of index-linkages under the Economic Emergency Powers Act

1. Acceptance of new index accounts by financial institutions has been discontinued and will not be re-introduced later. The index clauses of existing accounts will be applied until 30 November 1968, after which they will cease to be applied. Application of index clauses for credits granted by financial institutions or insurance companies, pension funds and other lenders will cease.

2. Financial institutions may collect an additional annual interest of 1 per cent at the most as long as a sum corresponding to the compensations payable on index deposits has accumulated in the index equalisation accounts controlled by the Bank of Finland.

3. The application of index clauses in rent contracts is prohibited. If rents were raised after 1 October 1967 because of an increase in the index increment payable on debts, the rents will be lowered to correspond to the relief effected in the loan costs.

4. Application of the index clauses in domestic contract work, delivery and merchandise delivery contracts is prohibited. However, the Prices and Wages Council may later permit an increase in these prices if it is necessary to avoid obviously unreasonable pricing.

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The list is arranged in sections as follows:

Theoretical, general and international
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United States
Finland
Brazil
France
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An innovation for stable real retirement income* C8

The most promising asset base is T-bills hedged against unanticipated inflation with commodity futures contracts.

Zvi Bodie

In no area of financial planning is the problem created by inflation more acute than in providing for retirement income. The essence of the problem is that a household's needs are defined in terms of real goods and services, while conventional private pension plans and contractual savings schemes offer a money-fixed stream of benefits. Although the problem is mitigated in the U.S. by Social Security provisions for a cost-of-living adjustment to retirement benefits, Social Security benefits for most households only provide a "floor" that must be supplemented at least in part with income from other retirement plans. It is no wonder, therefore, that labor unions have started to include a demand for cost-of-living escalators in pension benefits in their recent contract negotiations.

In an inflationary environment, conventional money-fixed pensions and contractual savings plans are risky both as vehicles for accumulating savings and as sources of retirement benefits. This was one of the considerations that led to the development of equity-based variable annuities (VA's) in the 1950's. At that time, many experts believed that common stocks could provide a hedge against inflation, in the sense that stock prices would *on average* increase at at least the same rate as the prices of consumption goods. Hence, by investing a portion of its retirement funds in an equity-based VA, the household could expect to protect itself against inflation.[1]

The experience with VA's has been disappointing but not really that surprising. After all, even if it were true, as many hypothesized, that the inflation-adjusted or real rate of return on common stocks is unaffected by the rate of inflation, this would not imply that they are a riskless investment. An investor who switched funds out of money-fixed securities and into stocks would at best be eliminating his exposure to inflation risk but only at the cost of exposing himself to substantial business and financial risk.[2]

The pensioner needs a different kind of annuity, one that is defined in purchasing-power terms. The purpose of this paper is to present a proposal for such a financial instrument, which we shall call a purchasing power annuity (PPA), and to explore its feasibility in the context of the U.S. financial system.

At first glance, the only asset that appears capable of providing a base for such an annuity would be default-free bonds linked to some index of the cost of living.[3] Although proposals for the U.S. government or some other institution to issue such price-indexed bonds have abounded, there is no indication that anyone with the power and authority to implement any of these proposals is inclined to do so.[4]

Given the apparent reluctance, if not outright opposition, on the part of the government and private corporations to the issuance of price-indexed bonds, the relevant question is whether we can find any other asset, or combination of assets, currently existing in

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1. Footnotes appear at the end of the article.

the U.S. financial system that could fulfill the same function. *The empirical evidence developed below suggests that the most promising asset base for PPA's is short-term bonds hedged against unanticipated inflation with a small position in a well-diversified portfolio of commodity futures contracts.*

The remainder of this paper is organized as follows: In the next part, we explore the inadequacies of conventional and equity-based variable annuities in an inflationary environment by contrasting them with a hypothetical PPA. We then try to assess the suitability of money market instruments hedged with commodity futures as the asset base for PPA's, and consider the possibility of having financial institutions offer them to the public. The major conclusion of the paper is that private pension plans could offer retiring employees a choice between a conventional money-fixed annuity or a PPA, both of which would cost the employer the same amount of money to fund, although this option would require the PPA benefit level in the first few years of retirement to be lower than that of the conventional annuity.

THE NATURE OF THE PROBLEM AND THE DEMAND FOR PPA's

The best way to consider the problems created by conventional annuities in a period of rapid and unpredictable inflation is to divide a household's lifetime into a pre-retirement (or accumulation) period and a retirement period. We will first focus on the accumulation phase by assuming that the household has decided (a) that it will need a fund of $100,000 in terms of today's purchasing power in order to finance its consumption flow during retirement and (b) that it has 30 years left before then. At an 8% per year rate of inflation, the fund would have to have a *nominal* value of $1,006,266 in it 30 years from now in order for its *real* value in terms of today's purchasing power to be $100,000 — a ratio of roughly 10 to 1.

Two major problems arise when the household tries to meet this savings goal with a conventional retirement savings plan, which calls for equal periodic dollar contributions over the working years. The first problem is that the time pattern of contributions in real terms will not in general match the time pattern of the household's real labor income; the second is that there will be considerable uncertainty about the eventual purchasing power of the dollar amount accumulated in the fund. An example will clarify both of these problems.

Suppose the household is considering a conventional retirement savings plan offering a nominal interest rate of 8% per year and consisting of 30 equal annual contributions. In order to accumulate $1,006,266 by the end of the 30 year period, the annual premium would have to be $8883. For most households this would represent an unrealistically high proportion of its current labor income.

On the other hand, if the household's nominal labor income keeps pace with inflation during the working years, even with no real income growth, the ratio of premium to income by the end of the period will have shrunk to one-tenth its initial value. Furthermore, with the conventional plan the household has no assurance that its savings goal will be met in real terms. Since the rate of inflation is not known with certainty, the real value of the fund at retirement may turn out to be far from 100,000 constant dollars (c$100,000). For example, if the rate of inflation averages 10% per year, the real value of the fund will be only c$57,668, while at 6% per year inflation its real value will be c$175,201.

Now let us contrast this conventional money-fixed savings plan with a hypothetical PPA, which calls for a level flow of annual contributions in terms of *constant* dollars. The expected *real* rate of interest assumed on the conventional plan was zero, so let us use that same real rate for the PPA. In order to accumulate c$100,000 at the end of 30 years, the annual premium would have to be c$3333 ⅓. The current dollar amount of the premium at 8% per year inflation would start at $3,600 at the end of the first year and climb to $33,54 by the last payment. Assuming the household's labor income remains constant in real terms, the ratio of premium to income remains constant.

PARTIAL ALTERNATIVES: VA's

Many insurance companies have in recent years taken steps to move partially in the direction of the PPA accumulation idea by including a cost-of-living clause in their insured savings plans. Although this clause allows policyholders to increase coverage in accordance with the annual rise in the price level, the interest rate earned under these plans typically remains fixed in nominal terms; hence, the saver may achieve a better time-profile of contributions, but he still faces considerable risk of not achieving his ultimate savings goal in real terms.

In order to deal with this latter problem of fixed nominal earnings rate, insurance companies started offering equity-based variable annuities (VA's) in the 1950's. The impetus for creating these savings plans came from the idea that common stocks are a *long-run* hedge against inflation, in the sense that over a long holding period one could count on earning a positive real rate of return, i.e., a nominal rate of at least whatever the rate of inflation turned out to be.

Unfortunately, this idea has only limited meri

even if it were true that the mean real rate of return on equity is positive regardless of the rate of inflation. If the annual fluctuations around the mean are independently distributed and fairly large, then, even with an investment horizon far in the future, one can fall well short of one's savings target.

For example, suppose we wanted to invest a sum now that would provide us with c$100,000 for retirement 30 years from now. If we could count on a 4% per year real rate of return, then we would have to invest $30,832. But if the average compound real rate of return turned out to be off by only 1%, so that we wound up earning only 3% rather than 4% per year, we would have only c$74,837 at the end of the 30 year period.

Of course, an equity-based VA offering a *mean* real rate of return of 4% per year may be an attractive alternative to a conventional annuity offering an expected real rate of return of zero. By dividing its retirement savings between a conventional money-fixed plan and a VA, in fact, the household can achieve a better risk-return combination than by investing all of its funds in either one alone. Nevertheless, no mixture of these two types of savings plan can provide the household with a truly low risk option in *real* terms.

On the other hand, one should avoid exaggerating the severity of the problem created by inflation during the accumulation phase, because wages do tend to keep pace with inflation. Most corporate defined-benefit pension plans link the starting level of benefits to the employee's final wages, thus effectively offering protection against inflation in the accumulation phase. Furthermore, a household can save for retirement by setting aside a fixed percentage of its annual income rather than a fixed dollar amount.

MORE ACUTE PROBLEMS COME LATER

The need for a PPA alternative to conventional money-fixed annuities and equity-based VA's is even greater in the retirement phase of the household's lifetime. Let us first consider the conventional money-fixed annuity. Even with a deterministic rate of inflation, equal periodic dollar amounts imply a negative "tilt" to the stream of real retirement income, which many households might not want. Moreover, in an environment with an uncertain rate of inflation, both the level and the slope of the real stream of benefits are unpredictable and out of the beneficiary's control.

To illustrate this point, let us consider a conventional retirement annuity that will last 15 years (from retirement until death) at a nominal interest rate of 8% per year as compared to a hypothetical purchasing-power annuity (PPA) earning a real interest rate of zero. In comparing conventional annuities to PPA's, we must recognize that the relevant comparison is not between a conventional money-fixed annuity and the *same* annuity with an escalator clause. In pension planning as in all other areas of personal finance, there is no free lunch! Assuming that the beneficiary has accumulated $100,000 for retirement, the PPA would pay the annuitant c$6,667 per year, while the conventional annuity would pay $11,683 per year.

Table 1 and Figure 1 show the pattern of real income flows associated with the conventional annuity for various rates of inflation. If, as anticipated, the actual rate of inflation over the life of the annuity turns out to be 8% per year, then the real value of the conventional annuity flow will start at c$10,818 in the first year and fall to c$3683 in the fifteenth. Some retirees might view this pattern as preferable to a constant real flow of c$6667 per year, but the conventional annuity offers no guarantee that it will be realized. Should the rate of inflation turn out to be 12% per year, the stream of real payments will be both lower and more steeply tilted than anticipated, starting at c$10,431 in year 1 and falling to c$2134 by year 15. Of course, if the retiree is lucky, the rate of inflation might turn out to be less than 8% per year, but most people would prefer not to speculate with their retirement income.

TABLE 1

Real Value of Cash Flow of $11,683 per year from a Conventional Annuity at Selected Rates of Inflation

	Rate of Inflation				
Year	4%	6%	8%	10%	12%
1	c$11,234	c$11,022	c$10,818	c$10,621	c$10,431
3	10,386	9,809	9,274	8,778	8,316
5	9,603	8,730	7,951	7,254	6,629
7	8,878	7,770	6,817	5,995	5,285
10	7,893	6,524	5,411	4,504	3,762
12	7,297	5,806	4,639	3,723	2,999
15	6,487	4,875	3,683	2,797	2,134

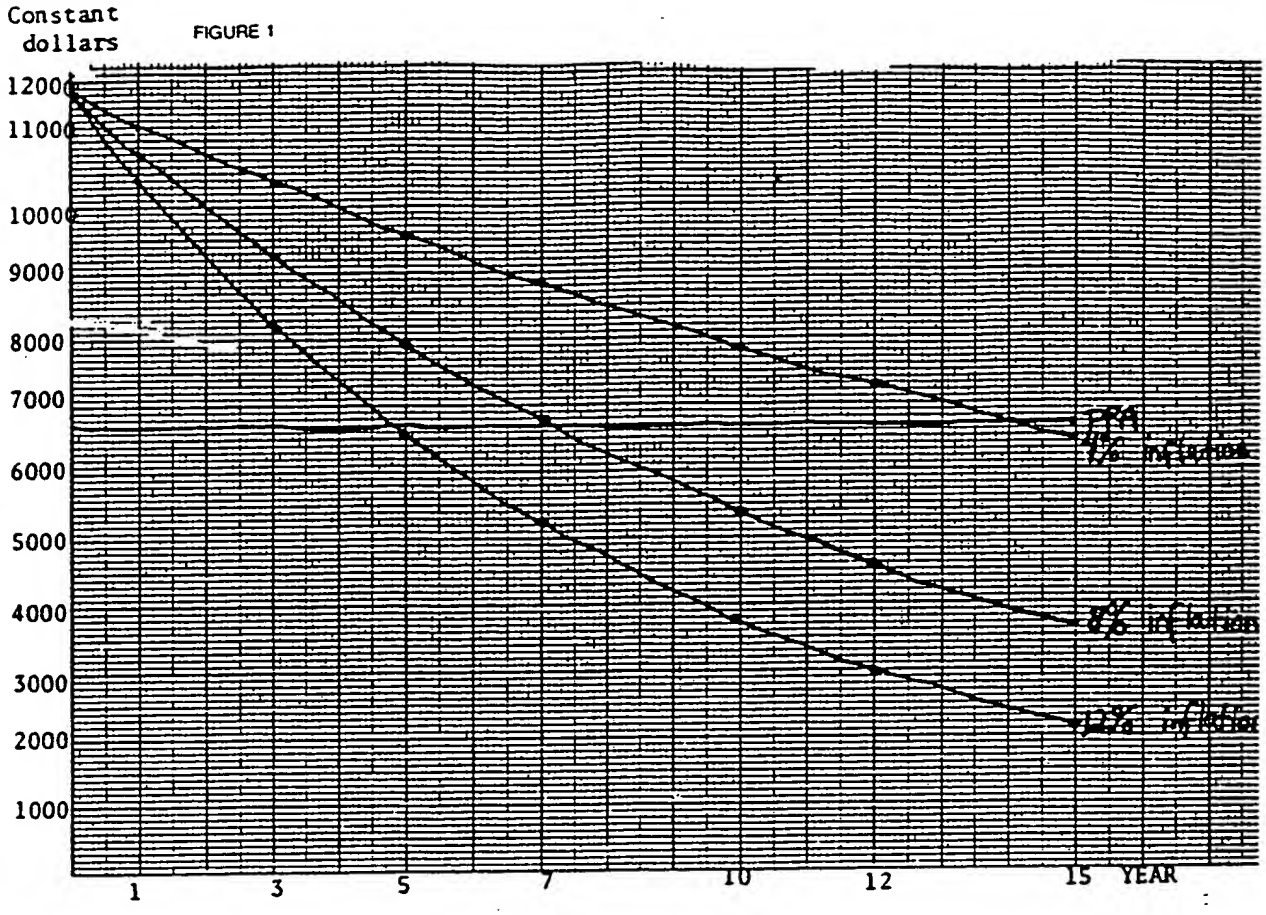
The symbol c$ stands for constant dollars

For retirees who like the idea of a real stream of retirement benefits which has a downward tilt, the design of a PPA with this property would be relatively simple. The essential distinguishing feature of the PPA, however, would remain the same: The slope and level of the benefit stream should be fixed in real terms and unaffected by the actual rate of inflation.

THE VA FULLY EXAMINED

This brings us again to a consideration of equity-based variable annuities. Under a VA, the annuitant's retirement fund is invested in a diversified

FIGURE 1



portfolio of common stocks managed by the institution offering the annuity. The annuitant ends up by assuming most of the risk associated with the value of this portfolio, and the rate of return on it as the periodic benefit is defined in terms of a fixed number of annuity units, which are essentially shares of the underlying stock portfolio. The dollar amount of the benefit is then just the fixed number of annuity units times the current market value of a unit.

We can illustrate the VA and its drawbacks with a concrete example. Since there are some differences in the kinds of VA's offered, we will focus on a hypothetical one, which typifies the species. As in the case of the conventional, money-fixed annuity, let us assume that our household has accumulated $100,000 in its retirement fund and is purchasing a 15-year annuity. The insurance company uses this money to buy a portfolio of stocks and sets the initial number of annuity units or "shares" at 10,000, each thus having an initial value of $10. It then determines an assumed earnings rate in order to compute the amount of the periodic payment in terms of annuity units. Let us assume a 4% per year rate, which represents a "conservative" judgement on the part of the company as to the average real rate of return to be earned on the stock portfolio. The annuity benefit will then be 899.4 ar nuity units per year.

Now, if the total real rate of return (dividenc plus capital gains) on the stock portfolio year after ye turned out to be 4% (which implies a nominal rate return equal to 4% plus the rate of inflation), then th nominal value of the portfolio would exactly keep pac with inflation and the real income stream from the V would be a level c$8994 per year. Even if the nomin market value of the stock portfolio did not exactly kee pace with inflation on an annual basis, but did so "o average" with relatively small annual deviations fro the trend, the VA would still be relatively attractiv

The actual experience with VA's, however, ha been disappointing. Figure 2 and Table 2 present th

TABLE 2

CREF ANNUITY UNIT VALUES SINCE 1952
(Annuity Year: May through April)

	Current dollars	Constant dollars (base year: 1967)		Current dollars	Constant dollars (1967)		Current dollars	Constant dollars (1967)
1952	$10.00	c$12.52	1961	$26.25	c$29.29	1970	$26.81	c$24.82
1953	8.46	11.78	1962	26.13	28.86	1971	30.44	25.20
1954	10.74	13.34	1963	22.48	24.67	1972	35.74	28.53
1955	14.11	17.56	1964	26.46	28.49	1973	31.58	23.84
1956	18.51	22.62	1965	28.21	29.82	1974	26.21	17.74
1957	16.88	19.96	1966	30.43	31.29	1975	31.84	19.49
1958	16.71	19.28	1967	31.92	31.92	1976	36.24	19.37
1959	22.03	25.22	1968	29.90	28.66	1977	32.80	15.61
1960	22.16	25.05	1969	32.50	29.54	1978	34.39	11.84
						1979	37.28	12.65

Source: Figure 2 is taken from TIAA-CREF [15], p.9 and Table 2 is based on TIAA-CREF [14], p. 19.

TABLE 3

Annual Real Rates of Return: 1953-1978
(per cent per year)

Year	(1) 1 Month Bills	(2) 1 Year Bills	(3) Bonds	(4) Stocks	(5) Commodity Futures	(6) Inflation
1953	1.19	1.48	2.99	−1.60	−3.46	0.62
1954	1.37	1.84	7.73	53.39	13.24	−0.50
1955	1.20	1.03	−1.66	31.07	−7.62	0.37
1956	−0.36	−0.29	−8.22	3.60	12.24	2.86
1957	0.12	0.18	4.30	−13.40	−5.04	3.02
1958	−0.22	0.79	−7.72	40.88	−3.47	1.76
1959	1.43	1.63	−3.70	10.30	−2.84	1.50
1960	1.16	3.38	12.12	−1.00	−3.93	1.48
1961	1.45	2.00	0.30	26.05	0.02	0.67
1962	1.49	1.91	5.60	−9.83	−2.39	1.22
1963	1.45	1.38	−0.43	20.81	1.52	1.65
1964	2.32	2.58	2.29	15.11	4.58	1.19
1965	1.97	2.04	−1.19	10.33	5.13	1.92
1966	1.36	1.45	0.29	−12.98	9.70	3.35
1967	1.14	1.84	−11.87	20.32	−0.06	3.04
1968	0.47	0.92	−4.76	6.05	−3.18	4.72
1969	0.44	0.20	−10.55	−13.77	12.19	6.11
1970	0.99	2.61	6.27	−1.40	−1.62	5.49
1971	1.00	1.73	9.55	10.59	−1.66	3.36
1972	0.42	0.91	2.20	15.06	29.55	3.41
1973	−1.72	−2.92	−9.11	−21.56	72.68	8.80
1974	−3.74	−4.45	−7.00	−34.47	15.04	12.20
1975	−1.13	0.06	2.04	28.21	−10.03	7.01
1976	0.26	1.43	11.39	18.16	4.56	4.81
1977	−1.55	−1.83	−6.97	−13.07	5.55	6.77
1978	−1.83	−1.72	−7.34	−2.42	18.54	9.03
Mean	0.41	0.78	−0.52	7.09	6.13	3.69
Standard Deviation	1.41	1.79	6.89	20.13	16.34	3.12
1953-72 Subperiod						
Mean	1.02	1.48	0.18	10.48	2.65	2.36
Standard Deviation	0.69	0.89	6.59	18.19	8.89	1.73
1973-78 Subperiod						
Mean	−1.62	−1.57	−2.83	−4.19	17.72	8.10
Standard Deviation	1.29	2.09	8.00	23.87	28.71	2.53

Sources: The data on 1 month bills, 20 year bonds, and stocks are from Ibbotson and Sinquefield, *Stocks, Bonds, Bills and Inflation*, Financial Analysts Research Foundation, 1977, updated using *The Wall Street Journal*.

The 1-year bill rate series is from Salomon Brothers, *Analytical Record of Yields and Yield Spreads*. The commodity futures series was derived from price data in *The Wall Street Journal* using a method explained in the text.

tion will remain high as long as interest rates remain volatile.

Column 4 presents the real rate of return on the Standard and Poor's Composite Index of common stocks, which is a value-weighted stock portfolio of the 500 largest corporations in the U.S. The return includes dividends and capital gains. As in the cases of bills and bonds, a dramatic decline in mean and increase in standard deviation occurred going from the 1953-72 to the 1973-78 subperiod. The mean falls from 10.48% per year to −4.19%, while the standard deviation rises from 18.19% to 23.87%. Looking at the year-by-year returns, we can see that stocks did especially badly in years in which the rate of inflation was high.

Thus, contrary to the usual assumption made in the economics literature — that the real return on stocks is uncorrelated with inflation — the data indicate a negative correlation.[7] To verify this negative correlation, we present in Table 4 the correlation

coefficients of the annual returns series reported in Table 3. The correlation coefficient between the real rate of return on common stocks and the rate of inflation was −.562 during the 1953-72 subperiod and −.768 during the 1973-78 subperiod. During the entire 26-year period, stocks seem to have behaved more like a money-fixed security than like a claim to a real asset.

TABLE 4

Correlation Matrix of Real Rates of Return

	1 Year Bills	20 Year Bonds	Stocks	Commodity Futures	Inflation
a. 1953-1978					
1 Month Bills	0.930	0.438	0.459	−0.417	−0.877
1 Year Bills		0.585	0.524	−0.547	−0.821
20 Year Bonds			0.223	−0.333	−0.404
Stocks				−0.343	−0.612
Commodity Futures					0.455
b. 1953-1972					
1 Month Bills	0.740	0.352	0.097	−0.141	−0.442
1 Year Bills		0.583	0.103	−0.259	−0.302
20 Year Bonds			−0.075	−0.106	−0.295
Stocks				0.052	−0.562
Commodity Futures					0.205
c. 1973-1978					
1 Month Bills	0.941	0.760	0.797	−0.212	−0.967
1 Year Bills		0.870	0.932	−0.494	−0.915
20 Year Bonds			0.774	−0.531	−0.715
Stocks				−0.571	−0.768
Commodity Futures					0.325

Let us summarize the data we have examined so far. Bills have clearly offered a far more stable annual real rate of return than long-term bonds or stocks. Furthermore, the 1-month bills are more stable than 1-year bills. But there is still variation in the real return on 1-month bills, which is caused primarily by variation in the rate of inflation as revealed by the high negative correlation coefficients in the upper right hand corners of the matrices in Table 4. That correlation during the 1973-78 subperiod was −.967, indicating that 93.5% of the variance of the real rate of return on 1-month bills could be explained by inflation.

INTRODUCING COMMODITY FUTURES

We will now consider how much of the variance of the real return on bills could have been diversified away by using commodity futures contracts.

Column 5 in Table 3 presents the year-by-year annual rate of return one would have earned on a well-diversified portfolio of commodity futures contracts over the 1953-78 period.[8] The rate of return on a futures contract reflects the proportional change in the futures price over the holding period. The series was generated by assuming a buy-and-hold strategy whereby contracts were entered into at quarterly intervals, held for three months, and then liquidated. The number of commodities increases from 13 in 1953 to 22 by the end of the period. Table 5 presents the list of commodities and the year in which each was added to the portfolio. The portfolio was assumed to consist of equal dollar amounts invested in each commodity.

TABLE 5

List of Commodity Futures Contracts Included in the Portfolio

Commodity	Year in which it first entered the portfolio
Wheat	1953
Corn	1953
Oats	1953
Soybeans	1953
Soybean Oil	1953
Soybean Meal	1953
Potatoes	1953
Wool	1953
Cotton	1953
Eggs	1953
Cocoa	1953
Copper	1953
Sugar	1953
Silver	1963
Cattle	1964
Platinum	1964
Pork Bellies	1964
Hogs	1966
Orange Juice	1966
Broilers	1968
Lumber	1969
Plywood	1970

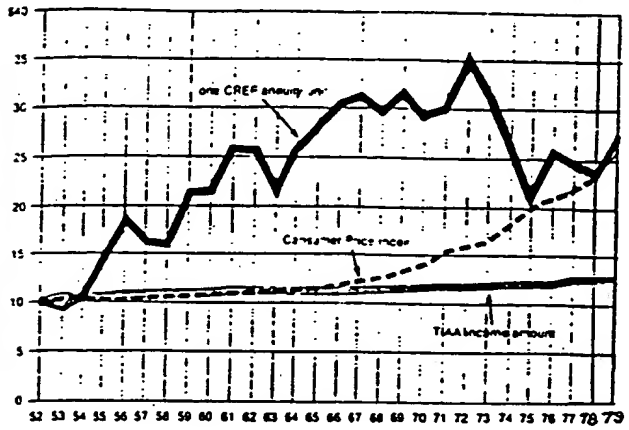
The rates of return for commodity futures listed in Column 5 of Table 3 requires an interpretation that is different from the real rates in Columns 1 through 4. When an investor takes a long position in a futures contract, he does not buy it in the sense that he would buy a stock, a bond, or the physical commodity itself. Rather, he agrees to purchase the commodity for a specified price at a certain point in the future. The commodities exchange, which acts as an intermediary, requires all parties to a futures contract to post bond, called "margin," to guarantee performance. Investors are, however, permitted to post Treasury Bills, on which they continue to earn the interest, so the funds used as margin are therefore not strictly speaking an investment in commodity futures.

Consequently, the rate of return reported in Column 5 should be interpreted as the *addition* to the total investment portfolio rate of return the investor would have earned in each year that had he taken a position in commodity futures equal to the value of his total investments in other assets. Alternatively, it can be interpreted as the additional rate of return he would have earned on the Treasury Bills posted as margin, assuming the amount posted was equal to 100% of the face value of the contracts.

Our principal interest in commodity futures

FIGURE 2

Changes in TIAA and CREF Income Amounts and the Consumer Price Index
(Initial incomes $10 per month beginning July 1, 1952)



experience of the College Retirement Equities Fund (CREF), which pioneered the VA. The value of an annuity unit at CREF's inception on July 1, 1952 was set at $10, which was worth c$12.52 in terms of 1967 purchasing power. Its real value has since fluctuated considerably in value from year to year, trending its way to a peak of c$31.92 in 1967 and then falling back to c$12.65 by 1978. It is ironic and disappointing that it has done so poorly in the last ten years, the period of the most rapid inflation.

Imagine the plight of a CREF beneficiary who started receiving his benefits in 1967, when the current dollar value of an annuity unit was $31.92. Assuming he had accumulated $100,000 in his fund prior to retirement, he would have been entitled to a monthly benefit of 19.103 annuity units, with a current dollar value of $609.76 per month.[6] In 1979 his monthly benefit would have been $521.13 in current dollars and only c$241.65 in terms of 1967 purchasing power.

Although equity-based VA's have failed to provide a source of stable real retirement income, the basic principle behind them could be applied in creating an annuity with characteristics similar to the hypothetical PPA described before. All that is needed is an asset offering a more stable real rate of return than common stocks.

MONEY MARKET INSTRUMENTS AS AN ASSET BASE FOR PPA's

The only assets that could offer a completely satisfactory investment base for PPA's would be securities explicitly linked to the consumer price level, such as index bonds or price-level-adjusted mortgages. In lieu of such index-linked securities, recent historical evidence suggests that the most promising asset base for PPA's in the U.S. is short-term bonds hedged against unanticipated inflation with a small position in a well-diversified portfolio of commodity futures contracts.

Unlike index bonds, these securities cannot provide a completely risk-free real rate of return. They can, however, produce a much more stable real rate of return than can be earned on the traditional pension fund assets, long-term bonds and common stocks. And unlike index bonds, they already exist.

Table 3 presents the year-by-year real rates of return one would have earned on various categories of investments during the 26-year period from January 1953 through December 1978. The first column is the real rate of return on a policy of "rolling-over" 30-day Treasury Bills. Fama[6] maintains that the nominal rate of return on 30-day T-Bills is determined as the sum of a time-invariant real rate plus the market's expectation of the rate of inflation over the coming month. If the market's short-run inflation expectations are fairly accurate, then the annual real rate of return reported in column 1 should not vary much over time. Indeed, over the period investigated by Fama, 1953 to 1972, the real rate on 30-day Bills averaged 1% per year and had a standard deviation of only 0.69%.

On the other hand, the last column in Table 3 shows that a serious escalation in the rate of inflation occurred in 1973 and 1974 and the real rate of return on Bills has not been able to recover since then. The mean real rate of return during the 1973-1978 period was −1.62% with a standard deviation of 1.29%.

Column 2 shows that by increasing the maturity of the Treasury Bills from a month to a year, an investor would have raised both his mean annual real rate of return and its standard deviation. During the 1953-1972 period, the mean would have increased by 46 basis points and the standard deviation by 20. Over the 1973-78 period, the difference in the means is only 5 basis points, while the difference in standard deviations is 80.

Column 3 presents the real rate of return an investor would have earned by investing in U.S. Treasury bonds with a 20-year maturity. The assumption underlying this series is that the investor bought a 20-year bond at the beginning of each year and sold it at the end. His return therefore includes both coupon interest and capital gains or losses. As the relatively low mean and high standard deviation in both subperiods indicate, the past 26 years was a bad time for the investor in long-term bonds. Capital losses caused by unanticipated increases in long-term interest rates tended to cancel the coupon yield over this period. While we may reasonably expect the mean real rate of return to be higher in the future, the standard devia-

contracts is to find out whether we can use them to reduce the variance of the real return on 1-month T-Bills. Their effectiveness for this purpose is determined by the degree of correlation between their rate of return and the real return on T-Bills.[9] Indeed, the square of the correlation coefficient measures the proportional reduction in the variance of the real rate of return on T-Bills attainable by combining them with the variance-minimizing proportion of commodity futures contracts. This optimal proportion is equal to the negative of the correlation coefficient multiplied by the ratio of the standard deviation of the real return on T-Bills to the standard deviation of the rate of return on commodity futures.

Using the parameters estimated over the entire 26 year period 1953-78 and reported in Tables 3 and 4, we find a correlation coefficient of −.417 and standard deviations of 1.41 and 16.34% respectively. The variance-minimizing proportion of commodity futures was therefore 3.6%, and the proportional reduction in variance 17.4%. This implies that the standard deviation of the real return on the resulting minimum-variance portfolio is 1.28% vs. 1.41% on 1-month T-Bills. The mean real rate of return on the minimum-variance portfolio is 0.63% per year vs. 0.41% on 1-month T-Bills.

Thus, by adding a small position (3.6%) in commodity futures to 1-month T-Bills, one could have attained both a smaller standard deviation and a higher mean during the 1953-1978 period.

To make the point in less technical terms: commodity futures are useful as an inflation hedge *because they perform particularly well in a period of high unanticipated inflation*. In such periods, commodity prices tend to rise sharply and to produce positive returns to a buy-and-hold strategy in commodity futures, while other assets, including T-Bills, do badly.

T-Bills hedged with commodity futures against unanticipated inflation appear to offer a relatively stable real rate of return, but even the hedged T-Bills had a disappointingly low mean real rate of return of −0.98% per year in the 1973-78 subperiod. While this is considerably better than the −1.62% on unhedged T-Bills, it is still low.

Finally, for investors who are not only interested in minimizing the variance of their real rate of return but are willing to take some additional risk, commodity futures offer a means of significantly expanding their "efficient portfolio frontier," i.e., of achieving a higher mean real rate of return for any given level of risk or a lower degree of risk for any given mean real rate of return. Table 4 shows that the rate of return on commodity futures is negatively correlated with the rates of return on stocks and bonds, thus allowing investors to diversify more efficiently. For example, a portfolio composed of stocks and commodity futures in equal proportions would have less than half the variance of either one alone — with no reduction in the mean.[10]

PPA's AND CORPORATE DEFINED-BENEFIT PENSION PLANS

Most private retirement income in the U.S. is provided by defined-benefit pension plans. Many of these plans already offer a kind of de facto purchasing-power guarantee to their employees through a benefit formula that bases the monthly retirement payment on the employee's wage just prior to retirement. Since wages and consumer prices are highly correlated in the long run, workers covered by such plans can at least count on purchasing-power protection of pension benefits during the *pre*-retirement years.

Very few pension plans offer a cost-of-living escalator during the *retirement* phase, however. In recent years, some corporations, under pressure from labor unions, have made one-time increases in pensions being paid to retired employees; if inflation persists at anything like its current rate, union pressure in this direction will probably increase. The analysis presented in this paper suggests that corporate pension plans could meet these union demands by offering a PPA option to their employees at retirement. Employees could be offered a choice between a conventional money-fixed annuity or a PPA, both of which would cost the employer the same amount of money to fund.

[1] See Greenough [9] for a more complete explanation of the VA idea.

[2] See Bodie [2] and [4] for a more complete discussion of this point.

[3] See Munnell [11] and Pesando [12].

[4] See Blinder [1], Fischer [7], Friedman [8], and Modigliani and Lessard [10] for a discussion of some of these proposals.

[5] See Friedman [8]

[6] The calculation was made according to the explanation given in TIAA-CREF [15] and presented in detail in the Appendix.

[7] See Bodie [3] for a more complete discussion of this point.

[8] For a more complete description of the commodity futures series see Bodie and Rosansky [5].

[9] Proof: Let s_p^2 be the variance of the real rate of return on an investment in T-Bills hedged with commodity futures contracts, and let x be the ratio of the face value of the position

in futures to the investment in T-Bills. Then:

$$s_p^2 = x^2 s_f^2 + 2x s_{f,T} + s_T^2$$

where s_f^2 is the variance of the rate of return on commodity futures, s_T^2 the variance of the real rate of return on T-Bills, and $s_{f,T}$ the covariance between them. The variance minimizing ratio, x^*, is found by setting the derivative of s_p^2 with respect to x equal to zero:

$$\frac{ds_p^2}{dx} = 2x s_f^2 + 2 s_{f,T} = 0$$

$$x^* = \frac{-s_{f,T}}{s_f^2}$$

Substituting this value for x back into the expression for s_p^2 we find that the resulting minimized variance is:

$$s_{min}^2 = \frac{-s_{f,T}^2}{s_f^2} + s_T^2$$

The proportional reduction in the variance of the real rate of return on the T-Bill is therefore:

$$\frac{s_T^2 - s_{min}^2}{s_T^2} = \frac{s_{f,T}^2}{s_f^2 s_T^2}$$

which is the square of the correlation coefficient between the real rate of return on T-Bills and the rate of return on commodity futures.

[10] For a more complete discussion of this point see Bodie and Rosansky [5].

APPENDIX

Using current mortality rates for male and female annuitants, the actuaries estimate that for a husband and wife both aged 65 there must be $164 on hand earning 4% a year (after expense charges) to pay them $1 monthly under the Joint and ⅔ to Survivor option.* The Annuity Factor then is 164 for this method of payment to a couple aged 65. Dividing the annuity owners' accumulated retirement fund by 164 gives the amount of monthly income payable to the couple as a Joint and ⅔ to Survivor annuity. Or, stated another way, each $16,400 of accumulated value would provide this couple an initial income of $100 a month.

To illustrate the conversion of accumulation units to annuity units, suppose that on April 1, 1978 you and your spouse were age 65 and began receiving a CREF monthly income under the Joint and ⅔ to Survivor option mentioned previously.

a. Assume that on April 1 the total value of your accumulation units was $50,000.

b. The value of your accumulation units would have been divided by the Annuity Factor of 164 to determine the initial amount of monthly income payable under the option selected
$50,000 ÷ 164 = $304.88 monthly.

c. To determine the number of annuity units that would be used each month to measure the changing value of your share in CREF's experience, the $304.88 would then have been divided by the current value of the annuity unit ($23.28 as of April 1, 1978).

Thus, your accumulation units would have been converted into a series of 13.096 annuity units payable each month as long as both you and your spouse live, and a series of 8.731 annuity units — ⅔ of 13.096 — payable to the survivor each month for life following the death of either you or your spouse, with payments in any event guaranteed to continue for a minimum of ten years. The monthly income of $304.88 (13.096 × $23.28) would continue until the next yearly revaluation of the annuity unit, at which time your monthly income for the succeeding year would be determined by multiplying your 13.096 annuity units by the new annuity unit value. The amount of your check would thus change on May 1 each year.

* This option pays a life-time income to husband and wife, with the amount reducing by a third at the death of either. If both die within the first ten years of payments, the two-thirds benefit continues to their named beneficiary for the balance of the ten-year period.

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INFLATION AND INDEXATION

Argentina, Brazil, and Israel

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Once some tax and expenditure[4] discipline and legitimacy are reestablished, and a minimum social consensus reached on income and wealth distribution, the old notion of isolating some key relative prices from the vagaries of unstable and unpredictable inflation regains its force. While the Sisyphean struggle with inflation goes on, the real exchange rate, and the real interest rate available to small savers, remain prime candidates for a type of indexing that avoids erratic fluctuations around plausible equilibrium levels, while allowing for changes in these relative prices when the equilibrium level appears affected by real shocks.

private banks. (These data were kindly made available by Dr. Russell B. Scholl, Chief, Private Capital Branch, Balance of Payments Division of the US Department of Commerce.) If Latin American assets in the United States yield 10 percent a year, a tax of 20 percent on such interest and profits would collect a yearly $3.2 billion.

4. During the Alfonsin administration important steps have been taken to cut military expenditures. The 1985 military budget is said to be half that of 1983, but still an astonishing 12.9 percent of GDP. See *The Economist* (London), 15 December 1984, p. 34.

3 *Inertial Inflation and Monetary Reform: Brazil*

Persio Arida and André Lara-Resende

For the last three decades Brazil has had double digit inflation. After annual inflation reached a rate of 100 percent briefly in 1964, the new military government launched a stabilization program which reduced inflation to levels slightly below 40 percent in 1965 and 1966. The relative success of this stabilization program was based on wage controls enforced by authoritarian measures, supplemented with selective price controls. In 1967 inflation was reduced to slightly below 20 percent. From 1967 to 1973, annual inflation was stabilized at about 20 percent despite a vigorous recovery that rapidly decreased unemployment and excess capacity indexes.

The 1973 oil supply shock increased the annual inflation rate to 40 percent in 1974–78. This four-year period showed remarkable stability in the inflation rate. The second oil shock, accompanied by the halving of the indexation interval for wages and rent contracts and a 30 percent devaluation of the cruzeiro on top of parity depreciation vis-à-vis the dollar at the end of 1979, explains the acceleration of inflation in 1979 and 1980 to the 100 percent level.

In face of rising inflation rates and growing evidence of balance of payments

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disequilibrium due to tightening of external credit markets, the government imposed austerity measures in late 1980. A package of fiscal measures envisaging across-the-board cuts in all public investment programs and anticipating corporate income tax was implemented.

Monetary policy had already become quite restrictive since mid-1980 due to the central bank's aggressive public debt policy in the open market. The central bank secured further monetary restriction by imposing quantitative credit limits on private banking at levels significantly below the current rate of inflation. Real interest rates rose sharply. The prime rate averaged 30 percent a year with consumer credit and marginal lending rates reaching even higher levels above monetary correction.

The reduced public sector deficit significantly affected economic activity. Industrial production, which averaged annual real growth above 7 percent in 1968–80, declined by almost 12 percent in 1981. Despite rapidly rising unemployment and the collapse of both public and private investment, however, inflation showed only a marginal decline from 110 percent in 1980 to 100 percent in 1981. This small improvement resulted from decreased growth rates in agricultural prices. Industrial price rises were unabated.

In 1982, industrial activity fell by almost 7 percent. With no help from agricultural prices, inflation did not recede but rather increased marginally.

The international debt crisis and the collapse of international credit markets that followed the Mexican moratorium of August 1982 brought on Brazil's external liquidity crisis. An agreement with the International Monetary Fund (IMF) was rapidly arranged to guarantee orderly external debt rescheduling. The IMF's adjustment program was standard: a decline in domestic absorption was to restore external and internal equilibrium. The IMF set tighter monetary targets and wanted to eliminate the public sector deficit; the nominal deficit, estimated at 16 percent of GDP in 1982, was expected to disappear after two years of the adjustment program.

All IMF nominal targets were revised after the 30 percent real exchange devaluation in February 1983. Even the revised targets, however, were shown to be unfeasible in subsequent quarters. The acceleration of inflation to 210 percent in 1983 rendered futile all attempts to comply with previously agreed nominal targets for monetary expansion. Once again, Brazilian inflation displayed extreme sensitivity to adverse supply shocks and insensitivity to restrictive demand policies. The role of indexation in inflation and the resulting impossibility of eliminating the nominal public sector deficit were not understood by the IMF at this time.

The need to define and measure the real or operational public sector deficit was eventually accepted by the Fund, and included as a parallel target in IMF stabilization programs. The real or operational public sector deficit is defined as the difference between the nominal deficit, the public sector borrowing requirement according to the IMF, and the value of monetary correction on the stock of indexed public debt. Most appraisals of Brazilian fiscal policy over the past two years confuse the two definitions of the public deficit.

The real public sector deficit was 8 percent of GNP in 1982, and 3.5 percent of GNP in 1983. At the end of 1984, the fiscal deficit had been almost eliminated. By all standards, this is a dramatic reversal of previous fiscal disequilibrium. The nominal deficit, however, has not been reduced. In fact, it has slightly increased. The discrepancy between the behavior of the nominal and real (or operational) deficits since 1982 is explained by the accelerating rate of inflation. It is easy to see that, if 200 percent inflation persists, complete elimination of the nominal deficit in one year would require a real fiscal surplus equal to two-thirds of the real value of the stock of public debt at the beginning of the year. Reduction of the real value of the stock of public deficit accumulated over the history of the economy to one-third of its value in one year is impossible. Since the portfolio equilibrium of agents in the economy is based on the real magnitudes of assets, it is clear that public financing requirements stemming from nominal recomposition of the real value of the public debt as it is eroded by inflation exert no pressure whatsoever on economic equilibrium. Lamentably, elementary confusions such as comparing the real savings rate to the nominal public deficit and calculations of alleged crowding-out effects of nominal rollover of the public debt are still frequent in debates about the Brazilian economy.

This confusion has been fostered because inflation showed no sign of receding in 1984 and is nearly 230 percent at year end. The resistance of inflation has led some experts to conclude mistakenly that the 1980–84 adjustment program never occurred. The spectacular trade balance reversal from a $3.5 billion dollar deficit in 1982 to a $6 billion surplus in 1983 and a $12.5 billion surplus in 1984 shows that adjustment has indeed occurred. Brazil's economy today is leaner than in 1980 and is invigorated. The reason for inflation's resistance to austerity measures is not the failure of the adjustment program, and must therefore be sought elsewhere.

MISCONCEPTIONS

Economic analysts have developed different theories to account for the failure of austerity measures to bring down inflation. This section briefly summarizes five of the most important approaches.

The first approach denies that austerity measures failed to reduce inflation. It argues that monetary restraint reduces inflation, but with a lag. The decline in output is viewed as the first phase of disinflation; this decline would give rise to a second phase of increased output and reduced inflation. Under this approach, Brazilian inflation will eventually diminish provided that monetary

contraction persists for a sufficiently long period of time. The problem with this approach is the unspecified time lag. Without explaining the abnormal lag that is allegedly preventing monetary control from affecting inflation, this approach offers merely an act of faith, not a firm basis for economic policy.

The second approach denies not the failure but rather the very existence of austerity measures. It rests upon a dogmatic belief that no inflation can occur without an underlying fiscal deficit being financed by monetary expansion. Faced with evidence of monetary contraction, the supporters of this approach point to the necessity of enlarging the concept of money, hoping to find a monetary aggregate sufficiently inclusive to explain the current inflation rate. Presented with evidence of stern fiscal policies, supporters of this approach allege mismeasurements of fiscal deficits. In a surprising twist of the usual arguments, they view inflation as revealing an otherwise hidden fiscal deficit. They suspect the validity of figures which show the fiscal deficit dramatically declining from 8 percent in 1982 to zero in 1984, despite IMF and central bank endorsement and the coherence of the figures to all available data. The argument that inflation testifies to the deficit which supposedly accounts for it, however, is fragile because elimination of the fiscal deficit in the operational concept is a condition necessary, but not sufficient, to curb inflation. Although the extent of the fiscal deficit is an empirical question, the refusal to accept evidence suggests that this approach prefers simple-minded theories to concrete realities. That it is always possible to find a monetary aggregate large enough to be highly correlated with inflation can hardly be taken as buttressing this approach.

The third approach recognizes both the existence and failure of austerity measures, but interprets them as testifying to the "psychological" nature of Brazilian inflation. Under this approach, inflation continues only because the monetary authorities have no credibility. Inflation is like a bubble whose expansion will stop with the installation of a new, credible government. The sudden end of hyperinflations is frequently cited to support this approach.

The deficiency of the third approach lies not in its emphasis on the expectational aspect of chronic processes of inflation, but in the fact that a mere quest for credibility falls short of providing an adequate strategy to deal with inflation. The psychological approach fails to take account of the rational basis of inflationary expectations, which is why it is unable to offer specific policy suggestions. The sudden end of hyperinflations offers valuable lessons which have not been explored by the supporters of this "psychological" approach but which will be discussed later in this paper.

The fourth approach favors the "orthodox shock." It argues that a much larger and more abrupt monetary contraction would bring inflation down. It criticizes current austerity measures for being too timid; it criticizes the psychological approach for not recognizing that credibility stems from the capacity to impose an absolute, definitive shock that would cure inflation by drastically curtailing nominal income.

The deficiency of the orthodox shock lies in the output and employment costs it would impose. Its effectiveness in reducing inflation is beyond doubt, but if its social and economic costs are too high, adjusting to the ongoing rate of inflation may, in the absence of better proposals, be better than trying to reduce inflation to any common-sense figure.

Monetary reform, which will be discussed in this paper, provides a disinflation strategy with much lower costs than the orthodox shock proposals. Under an orthodox demand shock, abrupt disinflation is likely to be accompanied by drastic changes in relative prices. But contracts in Brazil have a fixed time period. The real value of the contract over the period depends on the ruling inflation rate even if the contract contemplates full restoration of the previous peak level after every period. Under these circumstances, an abrupt decline of inflation from 230 percent to 0 percent, for example, would mean an immediate increase of approximately 30 percent in real wages, since nominal wages are readjusted every six months in accordance with past inflation. It requires little imagination to foresee the disruptive effects of sudden changes in relative prices in an economy in which all contracts have indexation clauses.

The fifth approach calls for a "heterodox shock." Supporters of this approach recognize the inertial character of Brazilian inflation. Instead of breaking down inertia by demand management, however, they favor administrative controls. Some form of social pact would bring inflation to zero by freezing nominal wages, fixing the exchange rate, and controlling prices. The freeze would eliminate the inertial component of inflation. Since the fiscal deficit in the operational concept is negligible, agents would have reason to believe that, after the end of the temporary freeze, zero inflation would persist.

The strength of the heterodox shock proposal lies in its recognition of the inertial nature of Brazilian inflation; its weakness lies in its remedies. Under severe inflation relative prices are very volatile. A photograph of the economy at any given point in time would show disequilibrium relative prices. It is only through time that relative prices achieve fragile equilibrium. To freeze nominal prices by legislative fiat would inevitably freeze disequilibrium relative prices. If the announced freeze were too short, it would fail to suppress the inflation drive inherited from the past; if too long, the inconsistency of relative prices as well as any shocks to supply and demand would have to be absorbed by rationing. The lifting of the freeze would probably be followed by strong pressures to restore previous relativities, which would revive inflation.

Leaving aside the nearly insurmountable practical obstacles to the implementation of a successful wage and price freeze, two aspects of the heterodox shock deserve emphasis. The first is its correct diagnosis of inertial inflation, which will be discussed in the next section. The second is its argument for monetary expansion. When wages and prices are frozen, money recuperates its function as a store of value. The losses incurred in keeping money during the freeze period are limited to the real interest rate. The demand for money during the freeze increases. Without a monetary expansion, the

freeze would unleash deflationary pressures. Similar results follow the indexation of money. For if wages and prices increase in nominal terms, but money is indexed to the ongoing rate of inflation, money recuperates its store of value function in exactly the same way as under the heterodox proposal. For a given level of income, the demand for indexed money also depends solely upon the real interest rate.

These considerations suggest that the counterpart of the freeze proposal is the issue of indexed money. But before turning to the mechanics of monetary reform, we will discuss inertial inflation.

INERTIAL INFLATION AND INDEXATION

Inflation becomes inertial when contracts have indexation clauses that restore their real value after fixed intervals of time. Central to inertial inflation is the fact that the readjustment of nominal contract values by 100 percent of the inflation over the previous period does *not* assure the targeted constancy of real value. For given the length of the period that elapses between two readjustments, the average real value of a given contract depends on the ruling inflation rate even if the contract contemplates full readjustment of losses due to past inflation. Unless the length of the period is minimal, 100 percent indexation clauses are an imperfect hedge against inflation. For a given indexation period, the higher the inflation rate, the smaller the real value of the contract. For a given inflation rate, the shorter the period between readjustments, the higher the real value of the contract. The rate of inflation and the length of the indexation period are the two crucial dimensions of contracts with 100 percent indexation clauses in processes of inertial inflation.

These two dimensions, however, are not independent. The Brazilian economy does not provide an exception to the rule that large accelerations of inflation lead to a reduction in the normal length of contracts. Given the transaction costs involved in recasting contracts, minor accelerations of inflation are not offset by reductions in the indexation period. But the losses caused by large accelerations of inflation render the legal recasting of contracts inevitable. The higher the ongoing rate of inflation, the smaller the normal indexation period tends to be.

Sluggishness in adjusting the indexation period is a mixed blessing. From the viewpoint of supply shocks, it is certainly desirable, for the change in relative prices brought by a supply shock occurs in an indexed economy by alterations in the rate of inflation. If agents respond rapidly to any acceleration of inflation by reducing the length of the indexation period, a small change in relative prices leads to a dramatic acceleration in the inflation rate. It is trivial to show that the inflation rate caused by the real devaluation of February 1983 would be much higher if workers succeeded in imposing three-month indexed contracts in place of the current semiannual contracts. The inflationary sequel

to a supply shock depends crucially upon the barriers preventing agents from defending themselves against the change in relative prices by imposing shorter indexation periods.

From the viewpoint of inertia, however, the sluggishness in adjusting the indexation period is unfortunate. For it is the indexation period that governs the memory of the economic system. For simplicity, imagine that contracts are staggered over time. All contracts are of the same duration, say six months. At each point in time, the nominal value of each contract is revised upwards, and events that happened up to six months before affect the future price increase. Six months is the duration of the memory of the economic system. If one succeeds in decreasing the rate of inflation in period t, for example, this success is undermined by the fact that contracts revised in period $t + 1$ remember the higher inflation rates prevailing from period $t - 5$ to t. Thus, zeroing the memory of the system is a crucial condition for breaking down inertia.

This crucial condition is met during hyperinflations. One of the secrets of successful endings of hyperinflations is that during a hyperinflation, all the presumed conveniences of long contract periods are overriden by the need to revise prices almost continuously. The inertia by which events that happened six months before imprint their mark upon the present disappears. Hyperinflations carry in themselves the seeds of their own destruction in that they force agents to reduce the contract period. If the path from a low three digit inflation to a hyperinflation could be traversed without costs, one possible solution to Brazilian inflation would be to inflate the economy up to hyperinflation to shrink the memory of the economic system. Needless to say, the hardships caused by hyperinflations rule out this solution. Yet the lesson remains. Monetary reform separates out the desired effect—namely, the reduction in the indexation period, from its spontaneous cause, namely, the acceleration of inflation. Monetary reform shrinks the memory of the economic system without hyperinflation.

Two aspects of indexation deserve emphasis in this connection. The first is the failure to deindex wages. This was tried in 1983: following negotiations with the IMF, Congress approved a scheme replacing 100 percent indexation by approximately 90 percent indexation. This had little effect on the private sector and state enterprises after the first month, since employers proved willing to maintain 100 percent awards when pressed by unions. It had more effect on the public sector, which was forbidden to strike, but increasing pressure led to a reinstatement of 100 percent indexation after about six months.

The second aspect is the fact that indexation by contracts revised in fixed-length intervals of time is not perfect (from the practical point of view) unless the interval is very small. Why would agents, and particularly workers, adhere to the fixed-length interval contract if the indexation clause supposedly aims to keep the real value of the contract constant?

argue that monetary policy has not been sufficiently restrictive; or that the external constraint cannot be solved without permanent debt reform. Acceptance of the *predominantly* inertial nature of current inflation is, however, essential. That is, a major determinant of current inflation is past inflation itself. The absolute validity of these three premises would guarantee that monetary reform is a sufficient condition for price stability. If inflation is not purely inertial, monetary reform is still necessary to stabilize prices, but it would need to be preceded by action on the fundamentals.

Monetary reform is not meant to be a substitute for policies which attack the fundamentals of inflationary processes. There is no point in implementing a monetary reform if inflation stems primarily from fiscal deficits or supply shocks. Monetary reform deals with the inertial component of inflation—neither more nor less. In our view, the denial that Brazilian inflation is predominantly inertial, driven by indexation contracts, is hardly tenable.

The monetary reform proposed in this paper consists of the following elements:

- The introduction of indexed money. On a preannounced date, the new cruzeiro (NC) will be put into circulation. The NC would have a fixed, one-to-one parity with the ORTN. During a transition period, the ORTN appreciation will continue to be determined by the change in the general price index calculated in cruzeiros. The value of the ORTN in terms of the cruzeiro would be revised as information on the rate of change in the general price index becomes available (approximately 10 days after the end of the month). The exchange rate between the NC and the cruzeiro would be revised daily in accordance with geometrical interpolation of the available ORTN values.
- During the transition period, the exchange rate in cruzeiros would follow the crawling peg system. Ignoring foreign inflation, the exchange rate in NC will remain constant at the real exchange rate prevailing before the monetary reform. Capital controls will not be lifted.
- Beginning on the day the NC is introduced, agents are allowed to convert cruzeiros to NC or vice-versa at the going exchange rate. The conversion will be undertaken in commercial banks and other preannounced places. The possibility of free conversion of cruzeiros into NC is essential to avoid an increase in the velocity of circulation of cruzeiros. If the introduction of NC were associated with the repudiation of cruzeiros, increased inflation as measured in cruzeiros would become inevitable. In the monetary reform, the central bank accommodates the demand for NC at the daily rate of exchange.
- Demand deposits in the banking system would be immediately converted into NC and thus defended against the depreciation of the cruzeiro.
- All transactions carried out by the central bank in financial markets would be quoted in NC. The central bank would set in NC the "overnight" rate that applies to daily funding of government bonds and bills. Time deposits, passbook savings, loans, and all other financial transactions would be denominated in NC.
- All ORTN contracts could be immediately transformed into NC contracts. Extant nominal contracts would be maintained. Since the central bank announces the daily quotation of NC, the computation of NC magnitudes for actual transaction purposes at maturity presents no difficulty.
- Administered prices set by government fiat would be immediately quoted in NC. The conversion would be made on the basis of the average real price in ORTN prevailing over the previous indexation period.
- The computation of inflation in cruzeiros would continue after the issuing of NC. Inflation in NC during the transition period in which cruzeiros and NC coexist is, *by definition*, nil. The superiority of the NC in terms of the three traditional functions of money—as a store of value, a unit of account, and a medium of exchange—will be obvious enough to induce a rapid switch of price quotations to the NC. As the number of prices quoted in NC increases, the very notion of a general price index in cruzeiros becomes meaningless. After the transition period, the need to compute the index of prices in cruzeiros disappears. Then, the central bank would simply fix the rate of depreciation of the cruzeiro relative to the NC equal to the average rate of inflation observed in the recent past. If, for example, this average were 10 percent per month, the cruzeiro would depreciate relative to the NC by 10 percent every month ad infinitum (or until the cruzeiro is eliminated). This depreciation would maintain the incentive to replace cruzeiros by NC. The real value of the residual stock of cruzeiros would approach zero rapidly.
- Wage indexation schemes, according to which nominal wage rates increase every six months based on inflation during the previous six months, would not be abolished by law. It would be possible, however, to opt for a conversion of wage contracts to NC in accordance with a defined formula. The conversion formula would calculate the average real wage in ORTN over the preceding six months and transform it into NC.
- The same conversion rule would apply for rents and all other indexed contracts. Apart from risk preferences derived from inflation fluctuations and possible inequalities in present discounted values due to interest rate effects, the conversion formula is intended to avoid giving either gains or losses to those switching to monthly NC contracts. However, those who wished to maintain their contracts indexed in cruzeiros would be allowed to do so. A definite incentive toward shifting to NC contracts might be provided by setting the rate of depreciation of old cruzeiros at a rate slightly above the average past rate of inflation.

These points summarize the most important elements of our monetary reform proposal. The next section focuses on macroeconomic aspects of monetary reform.

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
AUSTIN DIVISION

TRANS TEXAS HOLDINGS CORPORATION	§	
VS.	§	**NO. A 99 CA 658 SS**
PIMCO ADVISORS, L.P., and PIMCO FUNDS	§	

ORDER

BE IT REMEMBERED that on the 26th day of May 2000 the Court, in accordance with *Markman v. Westview Instruments, Inc.*, 52 F.3d 967 (Fed. Cir. 1995), *aff'd*, 116 S. Ct. 1384 (1996), held a hearing at which the parties appeared by representation of counsel and made oral arguments on their proposed claims construction. The patents at issue – the '461 and the '673 – disclose a system for managing deposit and loan accounts in a manner that is responsive to the rate of inflation. Specifically, the patents disclose a method for matching inflation indexed deposit accounts with similarly indexed loan accounts and anticipating the effects of these accounts on the existing capital structures of the institution or investor. After considering the briefs, the case file as a whole, and the applicable law, the Court enters the following opinion and order.

I.

The construction of claims, or the definition of the terms used in the claims, is a matter of law for the Court. When adopting a claims construction, the Court should first consider the intrinsic evidence, which includes the claims, the specification, and the prosecution history. *See Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996) (stating that intrinsic evidence is

"the most significant source of the legally operative meaning of disputed claim language"). Words in a claim are generally given their ordinary and customary meaning unless a patentee has chosen another definition which is clearly stated in the patent specification or file history. *See id.* Claims should also be construed, when possible, in a manner that will sustain their validity. *See Harris Corp. v. IXYS Corp.*, 114 F.3d 1149, 1153 (Fed. Cir. 1997) ("[C]laims should be read in a way that avoids ensnaring prior art if it is possible to do so . . . ."); *ACS Hosp. Sys., Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577 (Fed. Cir. 1984) (rejecting a district court's overly broad construction of claims that rendered the patent invalid). Based on the record, it appears the reliance on extrinsic evidence is not necessary. *See Vitronics Corp.*, 90 F.3d at 1583 ("In those cases where the public record unambiguously describes the scope of the patented invention, reliance on any extrinsic evidence is improper.").

When a term is defined in the specification, that definition is usually dispositive. *See Vitronics Corp.*, 90 F.3d at 1582 (describing the specification as the "single best guide to the meaning of a disputed term"); *Markman*, 52 F.3d at 979 (explaining that the specification may act as a dictionary when it defines terms used in the claims either expressly or by implication). However, the Court should also consider the language used in the preamble because this language can provide limitations on the invention described by the patent. *See Bell Communications v. Vitalink Communications*, 55 F.3d 615, 620-21 (Fed. Cir. 1995) (citing cases); *In re Paulsen*, 30 F.3d 1475, 1479 (Fed. Cir. 1994) ("[T]erms appearing in the preamble may be deemed limitations of a claim when they give meaning to the claim and properly define the invention.").

II.

Claim 24 of the '461 patent recites:

> In combination, in an investment system for managing inflation risk:
> means for establishing data representative of a deposit account with an institution, the deposit account having a principal component representing the cash investment of a depositor for an account term, and an accrual component comprising a fixed interest component which is enhanced at a fixed interest rate times the principal component and a variable interest component which is enhanced at an index responsive to the rate of inflation times the principal component; and
> an account management dataprocessor including means for paying the deposit account over the term.

A. An investment system

The plaintiff asserts the term "investment system" should be construed as "a deposit/loan inflation-adjusting system, which includes inflation adjusted deposit and loan accounts, an intermediary institution, and an account management data processor for servicing the accounts over their terms." The defendant asserts the term should be construed to mean "a programmed computer in the form of an account management dataprocessor for managing inflation risk."

Based on the prosecution history and the specification, the defendant argues the investment system is limited to a programmed computer. The patent examiner initially rejected all the claims of the '461 patent as unpatentable as disclosing a method of doing business and as directed to a mathematical algorithm. *See* Brief of Plaintiff [#16], Exh. 5-B. In an appeal brief from the examiner's rejection, the plaintiff explained "the disclosed embodiment of the invention is a programmed computer (account management dataprocessor), which performs specified functions." Plaintiff's Exh. P-2B, Tab 38, at 11. In its second supplemental reply brief, the plaintiff stated "Applicants respectfully assert that the claims on appeal are directed to a machine system that includes an account management dataprocessor (i.e., a programmed computer), which is clearly a

physical element, and are not directed to a method of doing business or a mathematical algorithm in the abstract." *Id.*, Exh. P-2B, Tab 43, at 2-3.

Based on the prosecution history, the Court finds the investment system disclosed by the '461 patent is limited to a dataprocessor that is programmed to perform certain functions. It appears that the examiner found the invention to be patentable only after the plaintiff clearly limited the "system" to being a programmed computer. Any broader interpretation of "investment system" would be inconsistent with the plaintiff's representations to the examiner during prosecution. The plaintiff's proposed construction is not permissible in light of the prosecution history of the '461 patent. *See Southwall Tech., Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1576 (Fed. Cir. 1995) ("The prosecution history limits the interpretation of claim terms so as to exclude any interpretation that was disclaimed during prosecution.").

B. Means for

According to the plaintiff, an account management dataprocessor is the structure disclosed by the specification for providing the means for performing each of the functions in the '461 patent. The defendant denies that any structure is disclosed as the "means" for performing any of the functions in the '461 patent. The defendant argues all the claims fail as indefinite.

The defendant's challenge is more properly raised in a motion for summary judgment. For purposes of claim construction, the Court construes the "means" as an account management dataprocessor. This determination does not prejudice the defendant's ability to raise its invalidity challenge in a subsequent motion.

C. Establishing data representative of a deposit account

The plaintiff asserts that "establishing representative data" means "establishing variable representative of accounts;" "deposit account" means "any deposit account, for example, mutual fund shares, units of an investment trust, pass-though securities, passbook savings accounts, or guaranteed investment contracts;" and "account" means "an account maintained by an institution for the purpose of receiving deposited funds, characterized by having a deposit principal component and a deposit accrual component." The defendant responds that the term "deposit accounts" should be construed as "an inflation-adjusted account owned by a depositor where the institution repays the depositor's principal and also provides the depositor at least a fixed rate of return on investment that exceeds the inflation rate."

Generally, the Court finds these terms to be sufficiently clear and self-explanatory so that no further definition is necessary. Nevertheless, the Court construes the term "deposit account" to be "an account maintained by an institution for the purpose of receiving deposited funds."

D. Principal Component

The plaintiff asserts the term "principal component" should be construed as "the proportion of the overall account balance attributable to the initial cash investment, and also represents the sum deposited or loaned." The defendant responds that the term should be construed as "the initial cash investment of a depositor that the institution must repay to the depositor."

The specification states the principal component "represent[s] the cash investment of a depositor." The Court will so construe the term, and finds that no further definition is necessary.

E. Accrual Component

The plaintiff asserts the term "accrual component" should be construed as "the proportion of the overall account balance that is attributable to inflation, fixed interest, and servicing fees, and will generally include both a fixed interest component and a variable interest component." The defendant responds that the term should be construed as "the proportion of the deposit account that increases over time in an amount equal to the fixed interest sub-component plus the variable interest sub-component."

According to the specification, "[t]he accrual component indicates that proportion of the overall account balance that is attributable to inflation and fixed interest." '461 Patent, col. 3, l. 3-5. Subsequently, the specification defines the accrual component as representing "that portion of the balance that is attributable to the effects of interest, servicing fees and inflation on the principal." *Id.*, col 5, l. 38-39. In accordance with the specification, the Court construes the term "accrual component" as "the proportion of the overall account balance that is attributable to inflation, fixed interest, and servicing fees."

F. Fixed Interest Component & Variable Interest Component

The plaintiff assert the term "fixed interest component" should be construed as "that portion of the accrual component that is attributable to a fixed rate of interest." The defendant responds that the term should be construed as "increasing in an amount equal to a fixed interest rate times the principal component."

The plaintiff asserts the term "variable interest component" should be construed as "that portion of the accrual component that is responsive to the rate of inflation." The defendant responds

that the term should be construed as "directly increasing at the rate of inflation times the principal component."

The language of claim 24 discloses "an accrual component comprising a fixed interest component which is enhanced at a fixed interest rate times the principal component and a variable interest component which is enhanced at an index responsive to the rate of inflation times the principal component." The Court finds this language to be sufficiently clear and does not require additional definition.

G. Means for paying the deposit account over the term

The plaintiff assert the term "paying the deposit account" should be construed as "providing funds contained in the deposit account." The plaintiff asserts "over the term" should be construed as "the time period over which the account is retired or 'paid out' to the accountholder." The defendant responds that "term" should be construed as "the length of time from the initial deposit until maturity (i.e., when the account has been entirely retired)."

The specification defines "account term" or "term" as "the time period over which the account is retired or 'paid out' to the account holder." '461 Patent, col. 3, l. 41-45. The Court adopts this construction based on the specification. The Court also adopts the plaintiff's proffered construction of "paying the deposit account."

III.

Claim 25 of the '461 patent recites:

> The combination of claim 24, the account term being divided into a plurality of iteration periods.

The plaintiff asserts the term "iteration" should be construed as "a predetermined payback period or interval over which the principal and interest of the deposit or loan account is paid back." The defendant has not offered an alternative construction, and the Court adopts the plaintiff's proposed construction.

IV.

Claim 36 of the '461 patent recites:

A system for managing deposit and loan accounts, comprising:
Means for establishing data representative of at least one deposit account for a term
Means for establishing data representative of at least one loan account for a term, the loan account having a loan principal component and a loan accrual component, the loan accrual component having a fixed interest component and variable and variable interest component; and
An account management dataprocessor for servicing the accounts over the term, comprising:
Means for adjusting the amount in the deposit account in a manner responsive to the rate of inflation;
Means for paying out the deposit account;
Means for determining the amount in the loan accrual component in a manner responsive to the rate of inflation; and
Means for retiring the loan account over the term, including
Means for retiring the fixed interest component by a first schedule over the term, and
Means for retiring the loan principal component by a second schedule over the term.

A. A system for managing deposit and loan accounts

The plaintiff asserts "a system for managing deposit and loan accounts" should be construed as "a deposit/loan inflation-adjusting system; including inflation-adjusted deposit and loan accounts, an intermediary institution, and an account management data processor for servicing the accounts over their terms." The defendant responds that the term should be construed as "a programmed

computer in the form of an account management dataprocessor for managing inflation-adjusted deposit and loan accounts."

As discussed above, the prosecution history establishes the plaintiff overcame the examiner's initial rejection by expressly limiting the "system" disclosed by the '461 patent as being a programmed computer. For this reason, the Court adopts the defendant's proposed construction.

B. Means for

As discussed above in the context of claim 24, the Court construes the "means" for performing the functions disclosed in claim 36 as an account management dataprocessor. This determination does not prejudice the defendant's ability to raise its invalidity challenge in a subsequent motion.

C. Establishing data representative of a loan account

The plaintiff asserts the term "loan account" should be construed as "an account established by an institution for the purpose of lending funds to borrowers, characterized by having a loan principal component and a loan accrual component." The defendant responds that the term should be construed as "an inflation-adjusted account for receiving payments on the fund that were let out by a financial institution, and not the purchase of a bond, where the payments include payment of all principal and a fixed interest rate of return in excess of the rate of inflation."

As discussed above, the Court generally finds these terms to be sufficiently clear and self-explanatory so that no further definition is necessary. Nevertheless, the Court construes the term "loan account" to be "an account maintained by an institution for the purpose of lending funds to borrowers." The defendant has failed to offer sufficient support from either the specification or the

prosecution history to support its argument that a "loan account" excludes a bond, and the Court declines to construe the term to include this limitation.

D. Responsive to the rate of inflation

The plaintiff asserts that "responsive to the rate of inflation" should be construed as "directly responsive to a market indicator of prior actual inflation and is not meant to include the market's expectation of future inflation." The defendant does not offer an alternative definition, and the Court adopts the plaintiff's proposed definition.

E. Paying out the deposit account

The plaintiff asserts "paying out the deposit account" should be construed as "paying the principal and accrual components of the account to the depositor over the term of the account." The defendant does not offer an alternative definition, and the Court adopts the plaintiff's proposed definition.

F. Retiring the loan account over the term

The plaintiff contends "retiring" should be construed as "a reduction in or paying out of a particular account component; the timing of the iteration or payback periods may include a predetermined retirement amount, where appropriate." The defendant does not offer an alternative definition, and the Court adopts the plaintiff's proposed definition.

V.

The '673 patent is a continuation in part of the '461 patent and contains an identical specification and identical drawings.

Claim 1 of the '673 patent recites:

A method of managing financial accounts comprising:
providing a plurality of deposit accounts with a financial institution
adjusting the amount in each deposit account as a function of the rate of inflation
providing at least one loan account with said financial institution using funds deposited with the financial institution;
adjusting the amount in the loan account as a function of the rate of inflation using an account data processor,
paying the deposit accounts, and
receiving repayment of the loan account by said financial institution in a manner where the funds in the loan account obtain a rate of return responsive to a rate of inflation.

A. Method of managing

The plaintiff argues the "method" described in Claims 1, 9, & 25 is not limited to a computer program. The plaintiff argues only the implementation of the method requires a computer. The defendant has not responded to this contention and the Court declines to address it at this time. Specifically, the Court declines to define "method" and will address this issue, if necessary, in subsequent motions for summary judgment.

B. As a function of the rate of inflation

The plaintiff argues that adjusting the amount in an account (either deposit or loan) means adapting the amount of funds in the account, either positively or negatively as a function of inflation. The plaintiff argues the amount of the adjustment does not need to have a one-to-one correlation with the rate of inflation.

The defendant responds that the plaintiff is attempting to use the '673 patent to improperly broaden the claims of the '461 patent with an eye toward this litigation. The defendant points out the application for the '673 patent was filed two months before the plaintiff filed the present lawsuit. The defendant points out the "as a function of the rate of inflation" language was not present in the

'461 patent. The '461 patent uses the phrase "responsive to the rate of inflation" which more clearly imparts a one-to-one correlation. The defendant argues the Court should construe the "as a function of" language to require the adjustment to be directly responsive to inflation. The defendant points out the specification only discloses a direct relationship between the market indicator of inflation and the account balance.

As the defendant points out, the specification of the '673 patent does not disclose or define the phrase "as a function of a rate of inflation." Nor does the plaintiff offer a specific definition, other than to argue that it does not require a one-to-one correlation with the rate of inflation. Generally, the Court would presume that different terms have different meanings. *Cf. Kraft Foods, Inc. v. International Trading Co.*, 203 F.3d 1362, 1368 (Fed. Cir. 2000) (noting that the doctrine of claim differentiation creates a presumption that each claim in a patent has a different scope). However, under these circumstances and based on this record, the Court is persuaded that the phrase "as a function of the rate of inflation" has the same meaning as the phrase "responsive to the rate of inflation," which has been construed as "directly responsive to a market indicator of prior actual inflation and is not meant to include the market's expectation of future inflation."

C. Based on a rate of inflation

Claims 9 and 25 contain the phrase "paying said depositor a rate of return on funds received based on a rate of inflation." The defendant argues this should be construed as requiring the financial institution to provide the depositor a fixed rate of return on the investment that exceeds the inflation rate. As discussed above, the specification does not define or explain the term "based on a rate of inflation." The plaintiff did not offer a proposed definition of this term. Based on the record, the Court declines to further construe this term other than to construe the term to require the

rate of return to be directly related to the rate of inflation. This direct relationship is supported by both the specification and the prosecution history.

D. Loan Account

The defendant argues that "loan account" should be construed as "an inflation-adjusted account for receiving payments on funds that were lent out by a financial institution." The defendant argues the term "loan account" does not include a bond, certificate of deposit, or an annuity. The defendant points out that the specification repeatedly refers to mortgage loans. The defendant also points out that Claim 3 recites that the deposit account comprises a bond account. The defendant concludes a bond account cannot be both a deposit account and a loan account. The plaintiff argues that a bond is one form of a loan account.

As discussed above in the context of the '461 patent, the Court is unpersuaded by the defendant's argument. Nothing in the specification or the prosecution history precludes a loan account from being a bond. The Court construes the term "loan account" to be "an account maintained by an institution for the purpose of lending funds to borrowers."

E. Financial Instrument

The plaintiff proposes "financial instrument," which is included in claims 9 and 25 of the '673 patent, should be construed as "an instrument having monetary value or recording a monetary transaction," including bonds, mortgages, certificates of deposit, annuities, and loans.

The defendant argues "financial instrument" should be limited to "an inflation-adjusted loan account for receiving payments on funds that were lent out by a financial institution, but not include a bond, a certificate of deposit, or an annuity." The defendant argues that dependent claims 17 and 27, which specifically recite that the financial instrument is a bond, are invalid on their face.

The issues asserted by the defendant are more appropriately raised in a motion for summary judgment concerning the validity of the '673 patent. At this time, the Court construes "financial instrument" as "an instrument having monetary value or recording a monetary transaction."

F. Payable on Demand

Claim 7 of the '673 patent recites the method of Claim 1, wherein the deposit account is payable on demand to the depositor.

The defendant argues this claim is invalid on its face because an account that is payable on demand would fly in the face of the purpose of the '673 patent. This argument is more appropriately raised in a motion for summary judgment and the Court declines to address this issue at this time.

Accordingly, the Court enters the following order:

IT IS ORDERED that the attached construction of the patent claims will be incorporated into any jury instructions given in the cause and will be applied by the Court in ruling on the issues raised in summary judgment.

SIGNED on this 26th day of August 2000.

UNITED STATES DISTRICT JUDGE

CONSTRUCTION OF CLAIMS
U.S. PATENT 5,832,461

An "investment system" is "a programmed computer in the form of an account management dataprocessor for managing inflation risk."

The "means for" performing the functions disclosed in the '461 is an account management dataprocessor.

A "deposit account" is "an account maintained by an institution for the purpose of receiving deposited funds."

The "principal component" "represents the cash investment of the depositor."

The "accrual component" is "the proportion of the overall account balance that is attributable to inflation, fixed interest, and servicing fees."

The "account term" or "term" is "the time period over which the account is retired or 'paid out' to the account holder."

"Paying the deposit account" means "providing the funds contained in the deposit account."

"Iteration" is "a predetermined payback period or interval over which the principal and interest of the deposit or loan account is paid back."

The "account term" or "term" is "the time period over which the account is retired or 'paid out' to the account holder."

A "system for managing deposit and loan accounts" as disclosed by Claim 36 of the '461 patent is "a programmed computer in the form of an account management dataprocessor."

A "loan account" is "an account maintained by an institution for the purpose of lending funds to borrowers."

"Responsive to the rate of inflation" means "directly responsive to a market indicator of prior actual inflation and is not meant to include the market's expectation of future inflation."

"Paying out the deposit account" means "paying the principal and accrual components of the account to the depositor over the term of the account."

"Retiring" means "a reduction in or paying out of a particular account component; the timing of the interation or payback period may include a predetermined retirement amount, where appropriate."

CONSTRUCTION OF CLAIMS
U.S. PATENT 6,052,673

"As a function of a rate of inflation" means "directly responsive to a market indicator of prior actual inflation and is not meant to include the market's expectation of future inflation."

"Based on a rate of inflation" requires the rate of return to be directly related to the rate of inflation.

A "loan account" is "an account maintained by an institution for the purpose of lending funds to borrowers."

A "financial instrument" is "an instrument having monetary value or recording a monetary transaction."